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The AUTOMOBILE

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The AUTOMOBILE

Industry's Elevator Service

Standardization Means Greater Efficiency at Lower Cost—Scientific Research Work Required More Urgently—Dimensional Standards Still Most Important—Many Standards Used Universally

By A. Ludlow Clayden
Chairman S. A. E. Standards Committee

THE why and wherefore of standardization; the enormous value of standardization to industry and to individual has been explained many times. No engineering body has ever done so much standardizing work in so short a space of time as the Society of Automobile Engineers, and this is all the more remarkable because automobile standards have been particularly hard to create.

This is because the sort of standardization which has been necessary in the automobile field apparently comes much closer to the individual engineer and to the ultimate user of the machine than does almost any other sort. *Apparently* only, because we have become so accustomed to the simpler standards that we cease to recognize them as such. The world would find life difficult indeed without the standards of measurement, without pounds, feet and gallons. If every merchant had his own standards for these things, so that a pound was sometimes six ounces and sometimes sixty, a foot anything from three inches to a yard, it is easy to see the awful confusion that would ensue. So it is with many other things, and we are floundering in all kinds of confusion to-day simply because we do not realize that it *is* confusion.

Dipping into history it is shown that it was the presence of confusion and the realization of its existence that caused governments throughout the world to step in and establish standards of weight and measurement by enactment. The realization of the confusion led to its elimination. The process began far earlier than we have any record; there are traces of it in the dimly distant past of Egypt; the Phoenicians spread their system over wide tracts of the earth. Thus we have no record as to whether the first man who suggested standards was, or was not, regarded as insane.

Most Standards Are Modern

It is a surprisingly short time since the weight, measure and money standards used in Europe were really well applied, and the engineering standards that exist are quite modern. The U. S. standard screw thread and the British Whitworth standard thread are examples of early engineering standardization by legislation, but we still see three or four different wire gages in use, and it is only the world of science that has shown itself advanced enough to adopt a universal standard of weight and measure. The advance of democracy must eventually break down the absurdity of national boundaries to such things as this. That Continental Europe, Great Britain and America should employ three different systems is almost as ridiculous as though New York and Pennsylvania were each to set up standards of their own invention.

Governments move slowly and they are only just commencing to take engineering standardization seriously in hand. Meanwhile engineers are developing standards which they use by agreement, some, but not all of which, will become subjects for enactment in the course of time. It is not all standards

that are suitable for legislation like weights and measures.

Essentials of a Standard

Standards divide into two main classes, scientific or fundamental standards and standards of custom or convenience, which are usually "dimensional" in nature. Thus weights and measures are standards of custom; there is no reason for the choice of any special unit; a convenient unit is taken and all the scheme of weight or measure erected upon it. Standard screw threads are a different matter. Here the desire is to choose a thread such that the strength of the thread and of the bolt will be equal quantities, which means that there is a fundamental reason for choosing definite dimensions.

Coming to automobile standardization we find that most of it existing is dimensional; the S. A. E. standards are mainly standards of custom and convenience. The S. A. E. standards:

1. Facilitate production.
2. Increase efficiency.
3. Decrease price.

These are the three essentials of a standard; if it does not do one or more of these three then it is a poor standard and of no value whatever.

Detail Requirements

Let us examine these three requirements in detail. To facilitate production, increase efficiency and decrease price is to increase the ease of buying, or, in the ultimate, to increase the ease of manufacture. A typical example of this sort of standard requirement is the case of carbureter flanges.

Originally each automobile engine designer when producing a new engine laid out what seemed to him

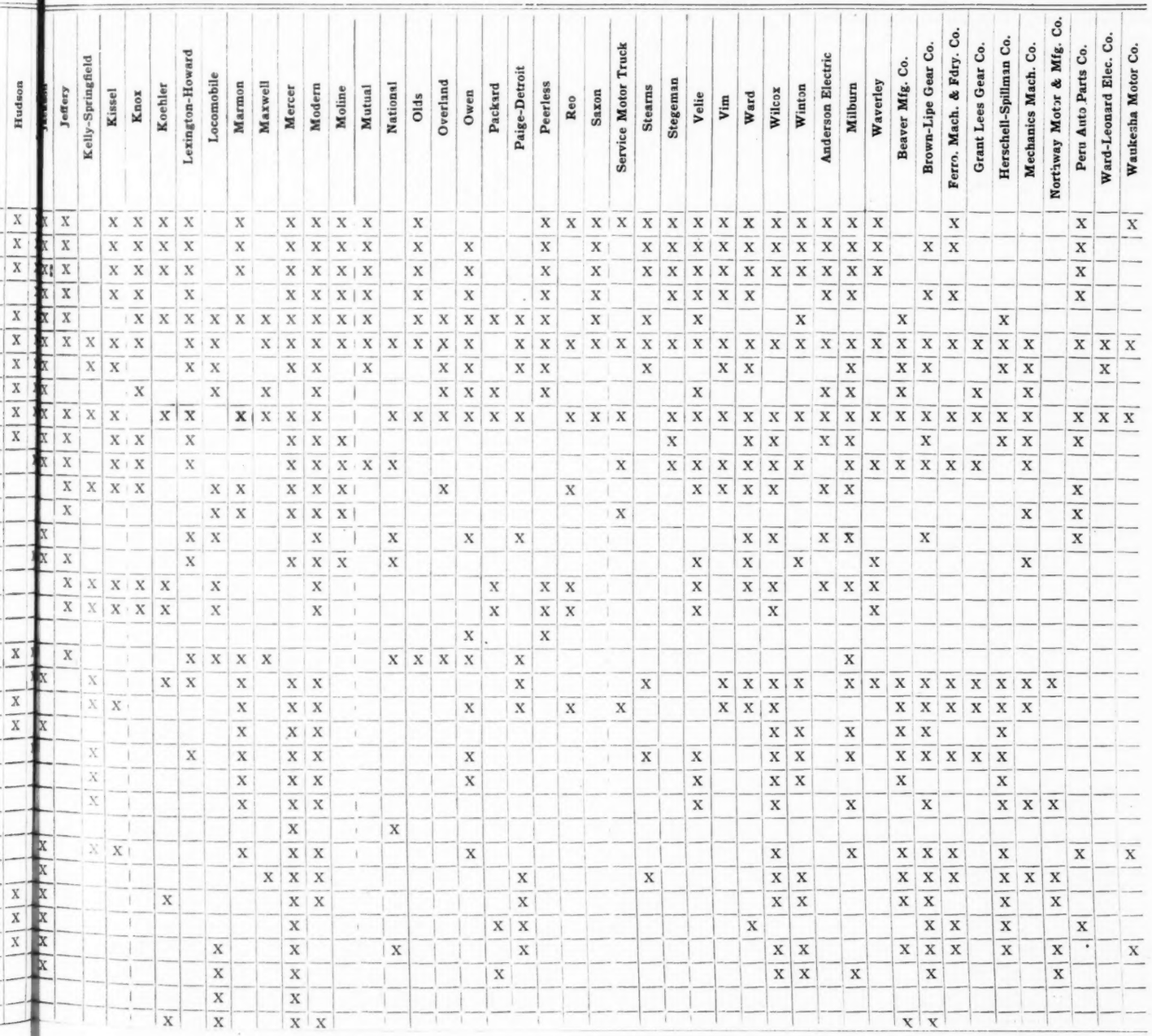
S. A. E. STANDARDS USED BY SEVENTY DIFFERENT FIRMS IN THE AUTOMOBILE INDUSTRY	Abbott-Detroit	Allen	Apperson	Autocar	Avery	Buick	Cadillac	Case	Chalmers	Chandler	Cole	Commerce	C-T-Co.	Denby	Dodge	Dort	Driggs-Seabury	Empire	Franklin	General Motors	General Vehicle	Gramm	Grant	Haynes	Hudson	Jeffery
Adjustable Yoke Rod Ends	X	X	X				X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X
Plain Yoke Rod Ends		X	X					X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X
Eye Yoke Rod Ends		X	X				X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
Rod End Pins			X	X			X		X	X	X	X			X	X	X	X	X	X	X			X		X
Spark Plugs	X	X	X	X	X		X	X	X	X	X	X		X	X	X			X	X	X	X	X	X	X	X
Screw Sizes to 1½ inches	X	X	X		X		X	X	X	X	X	X	X	X	X	X			X	X	X	X		X	X	X
Screw Tolerances	X	X			X					X	X	X	X	X	X				X	X		X		X	X	
Screw Threads Above 1½ inches				X						X				X					X	X					X	
Lock Washers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Square Broached Fittings		X		X			X	X				X	X	X	X								X	X	X	X
Taper Fittings	X	X					X			X	X			X	X		X	X				X	X	X		X
6-Spline Fittings		X								X	X	X	X						X				X	X		X
10-Spline Fittings				X			X				X		X					X								X
4-Spline Fittings	X									X				X					X			X	X	X		X
Taper Fitting with Castle Nuts		X		X			X			X		X		X	X	X	X			X		X	X			X
Solid Tires				X	X								X	X			X			X	X	X				X
Truck Wheel Diameter					X								X	X			X			X	X	X				X
Test of Rims															X											
Pneumatic Tire Sizes	X					X			X	X				X	X			X	X				X		X	X
Carbon Steels	X	X		X			X			X			X			X	X		X		X		X	X		X
Screw Stock				X						X		X		X	X								X	X	X	
Steel Castings		X							X	X			X			X					X				X	X
Nickel Steels		X		X	X		X			X			X	X							X			X		
Nickel Chrome Steels		X		X			X			X			X	X		X					X					
Chrome & Chrome Vanadium Steels	X						X			X									X							
Silico Manganese Steels							X						X	X												
Heat Treatments		X		X			X			X			X	X	X		X				X		X	X		X
Babbitt Metal	X				X			X		X				X				X								X
Bearing Metal, W. B		X								X			X	X				X							X	X
Phosphor Bronze		X												X	X						X			X	X	X
Brass Cast. Metals		X					X						X	X						X	X			X	X	X
Cast Manganese Bronze	X	X					X							X					X					X		X
Manganese Bronze Sheets and Rods															X											
Hard Cast Bronze														X												

a good flange on the side of the cylinder block or the end of the manifold for the attachment of the carbureter. Without doubt all the hundreds of flanges thus designed were perfectly satisfactory; they all gave enough area for proper compression of the gasket; they all had provision for studs or bolts large enough to enable a tight joint to be made. Carbureter makers, however, had to make their instruments with a flange to suit every engine. Often when three or four engine makers wanted the same size of carbureter they also asked for each a different flange, slightly different only, as a rule, but different enough to force the carbureter maker to have special tools, special jigs and even special carbureter body castings for each customer. Nobody obtained any benefit from this state of affairs except the tool maker, and every carbureter produced cost just a few cents more because of the greater amount of money tied up in tool equipment.

So was it with the sizes of steel tubes, so with lock washers, so with the specifications for steel and many other things. The S. A. E. took the ideas of all the engineers, made comparison between them, and rearranged them in a proper series which would satisfy all requirements.

An Elevator Service

The difference between the situation before and after S. A. E. standardization may be visualized as the difference between a flight of steps and an elevator. In a building of twenty floors somebody wants to get to each floor, but nobody wants to stand halfway between two stories. The S. A. E. put in an elevator which would stop twenty times and cut out the necessity for 500 stairs, and nobody had any use for the stairs from that time on. Thus in creat-



ing standards all that is necessary is to make sure that the elevator misses no floor and does not stop between any of them.

Now, the carbureter flange standard, the steel specification standards, the lock washer standards and many others were found by examining what was being done and then finding a series which would give the same results with fewer detail variations. These are standards based on practice or empirical standards.

Heavy Work Ahead

There are other matters which the S. A. E. has to consider which are more closely allied to the screw thread standard, in that they have but small reference to practice and are principally dependent upon fundamental principles. As time goes on the dimensional standards will become matter of course. It was necessary for the originators of the idea to prove that there was advantage in having a standard series of carbureter flanges, but there is no need to argue about the advantages of a standard speedometer drive connection or about the desirability of standard mountings for electric generators or starting motors.

Leads to the Laboratory

Thus the development of standardization work by the S. A. E., or any other engineering society, for that matter, leads inevitably to the laboratory, to the setting up of fundamental standards based upon scientific first principles.

Of such subjects the most important at present in hand is the question of lamp design. It is known that some headlights give good light with little glare, some give good light with much glare, some give little light with too much glare. To take all the lamps on the market and strike an average of their

S. A. E. STANDARDS USED BY SEVENTY DIFFERENT FIRMS IN THE AUTOMOBILE INDUSTRY

	Abbott-Detroit	Allen	Apperson	Autocar	Avery	Buick	Cadillac	Case	Chalmers	Chandler	Cole	Commerce	C-T-Co.	Denby	Dodge	Dort	Driggs-Seabury	Empire	Franklin	General Motors	General Vehicle	Gramm	Grant	Haynes	Hudson	Inter-State	Jeffery
Gear Bronze														X							X						X
Aluminum Alloys	X	X					X			X				X	X						X			X	X		X
Brass Sheets and Strips							X						X	X													
Brass and Tobin Bronze Rods															X												X
Non-Ferrous Metal Tubes	X						X																				
Steel Tubes		X	X	X		X	X		X	X		X	X	X	X			X			X		X	X	X	X	X
Bands and Strips	X			X						X				X	X							X			X		X
Pleasure Car Frames		X									X				X												
Ball Bearings	X	X		X		X	X		X	X		X	X	X	X			X		X	X		X	X			X	X
Carbureter Flanges	X	X		X	X	X		X	X	X	X			X			X	X		X			X			X	X	X
Flared Tube Unions	X	X	X	X	X			X	X	X	X	X		X			X			X		X	X	X	X	X	X	X
Gasoline Pipe Sizes	X		X	X	X		X	X	X	X	X			X	X	X	X	X				X	X	X	X	X	X	X
Flared Tube Ells and Tees	X	X	X		X				X	X	X	X		X	X		X			X		X	X	X	X	X	X	X
Throttle Levers	X			X										X	X										X	X	X	X
Magneto Dimensions		X	X	X	X				X	X		X		X	X			X		X				X		X	X	
Electric Bulb and Base Dimensions	X	X				X	X			X	X		X		X			X	X		X	X	X	X	X		X	X
Bulb Voltage Size and Refl. Labels	X	X					X			X	X				X			X	X						X	X	X	
Three-Speed Gearshift	X	X					X		X	X	X			X			X								X	X	X	X
Four-speed three-slot shift																												
Four-speed two-slot shift																											X	
Oversize Cylinders		X								X	X			X										X	X			
Storage Battery Directions	X	X					X		X	X	X			X	X				X						X	X		
Insulation Requirements	X						X			X	X				X				X									
Dimensions of Lead Batteries		X									X			X	X									X		X	X	
Ratings of Lead Batteries							X		X		X				X									X				
Additional of Elec. Appliances	X						X				X			X					X					X				
Ground Return	X						X		X		X			X	X									X		X	X	X
Test of Insulation Materials							X				X				X											X		
Fuse Dimensions									X	X														X				
Leaf Spring Nomenclature		X		X		X	X		X	X			X	X	X				X		X	X	X		X		X
Center Bolts	X					X		X		X										X							X
Spring Leaf Points	X						X		X	X		X			X										X		X
Engine Test Forms Vol. III		X												X											X		

optical dimensions would be useless. It would result in the production of a series of lamps of indifferent lighting quality and would certainly not increase efficiency, even if it decreased cost a little and facilitated production. Thus empirical standardization in this matter of lighting would not fill all three requirements and would not be of much value.

Accuracy Most Important

To get a standard that will be of use, necessitates careful laboratory work to decide, in exact terms, the effect of varying proportions in the filament of the bulb, in the curvature of the reflector, in the relation between the two, and so on. It is a far more difficult proposition than the empirical standard. First the tests must determine the ideals, and then investigation must show how close to those ideals we can get.

Another question now being considered which is of a similar nature is that of standard sizes for the drills to be used previous to tapping. Science calls for a perfect standard thread and practice cannot give it. Careful experiment is needed to determine the size of drill that will give the best thread in different materials so, though this is not theoretical work, it is work where the average of practice as it exists may have little relation to what that practice ought to be.

There are very many other things of a similar sort and, as the society grows in strength and in wealth, more and more of them will be taken up. In passing it may be remarked that the British Institution of Automobile Engineers has just commenced an investigation of steel standards for British use which will absorb a $10,000 grant from the British manufacturers' association.

The dimensional standards, however, remain the most important at present before the Standards

Inter-State	Jeffery	Kelly-Springfield	Kissel	Knox	Koehler	Lexington-Howard	Locomobile	Marmon	Maxwell	Mercer	Modern	Moline	Mutual	National	Olds	Overland	Owen	Packard	Paige-Detroit	Peerless	Reo	Saxon	Service Motor Truck	Stearns	Stegeman	Velie	Vim	Ward	Wilcox	Winton	Anderson Electric	Milburn	Waverley	Beaver Mfg. Co.	Brown-Lipe Gear Co.	Ferro. Mach. & Fdry. Co.	Grant Lees Gear Co.	Herschell-Spillman Co.	Mechanics Mach. Co.	Northway Motor & Mfg. Co.	Peru Auto Parts Co.	Ward-Leonard Elec. Co.	Waukesha Motor Co.
							X			X	X								X															X				X				
	X		X		X					X								X	X		X			X					X				X	X	X		X	X	X			
							X			X								X																						X		X	
	X						X			X								X																X								
							X			X	X																																
X	X		X		X	X		X	X	X	X	X					X		X	X				X		X				X	X		X	X	X		X		X	X		X
	X				X			X	X	X		X								X										X			X									
																																	X										
	X	X	X		X	X	X	X	X	X	X	X			X		X	X	X	X	X				X	X	X	X	X		X		X			X	X	X	X	X	X		X
X	X	X	X		X	X	X		X			X	X	X	X	X	X			X	X	X	X	X	X	X	X		X	X				X				X		X			X
X	X	X	X		X	X	X		X		X	X	X	X	X		X			X	X		X	X	X		X	X						X				X					X
X	X	X	X	X			X		X	X		X				X		X	X				X	X				X		X				X				X					X
X	X	X	X		X		X		X		X	X	X		X		X	X	X		X		X	X				X	X					X		X								
X	X	X			X		X		X		X	X		X			X																										
X	X		X	X	X	X	X	X	X		X	X			X		X	X	X									X	X					X		X							
	X	X								X	X				X		X		X	X							X		X		X		X										
X							X	X		X	X			X	X		X				X							X		X														
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	X						X	X		X	X	X				X	X											X	X		X												
	X						X			X	X	X					X				X							X		X													
	X						X	X		X	X					X				X																							
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Committee, for dimensional work based on existing practice is well advanced, while the scientific procedure is but beginning. There are now in hand fifty different things on which work is being done actively, and another fifty concerning which information is being collected. Outside this formidable list there are many other subjects that have been suggested and are not yet taken up; in fact, each day almost brings some new standardization proposal to the S. A. E. office.

24,000 Hours of Work

To-day the Standards Committee has 120 members and thirteen divisions; each member puts in an average of well over 50 hr. a year in division meetings, added to which are the general meetings of the Standards Committee and of the society as a whole. Thus the total of time given per year by each member of the committee is not less than 100 hr. The division chairmen and members entrusted with research work give much more time than this. Multiplying 100 by 120 gives a grand total of 12,000 hr. of work, and allowing for the special work done outside the meetings, for the work of the honorary officials and that of the staff of the society, this total will certainly not be less than doubled. Eight into 24,000 goes 3000 times, which means that the Standards Committee members do as many hours of work in a year as one man could do in 10 years working in a regular way.

The S. A. E. has lately been collecting information from the industry as to the actual application of the S. A. E. standards. A request was made to a number of manufacturers that they would state which of the long list of standards were employed in their products. The first results of the canvass appear on pages 666 to 669 and are worthy of special study. One or two points, however, must not be overlooked in reading this tabulation properly. First, it must be remembered that all of the standards cannot apply to one product; a passenger car does not use solid rubber tires, for example, nor does a transmission manufacturer require spark plugs. Secondly, it has been shown that several of the firms who appear to be making less extensive usage of the standards do not really know how many standards they employ. Some of the car assemblers, for example, are not fully informed as to the standards employed in making the transmissions or motors which are fitted to their chassis.

Wide Use of Standards Encouraging

On the other hand, the very wide use of standards by firms making complete vehicles is very striking. In some ways standardization is likely to be more valuable to the assembler than to the manufacturer of complete cars, or would seem so to be, but a glance at these records shows that this view is a wrong one. Another interesting thing is to follow the horizontal lines and see thereby the universality of many standards. There is no need to specify them here; the table itself gives sufficient conspicuousness to each.

Standardization began in a small way with the S. A. E. and ever since it has been the aim of every man who came into direct contact with the work to do his best to help speed up. The more that is done the more there remains to do.

Standards Committee of the S. A. E. for 1916

A. Ludlow Clayden, Chairman

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Ferdinand Jehle, Automobile Club of America
Daniel Roesch, Armour Inst. of Tech.
C. B. Veal, Purdue University

Springs Division

Chairman, C. W. McKinley, Willys-Overland Co.
Geo. C. Brainard, Hydraulic Pressed Steel Co.
C. E. Clemens, Perfection Spring Co.
Ralph L. Morgan
W. M. Newkirk, Wm. & Harvey Rowland, Inc.
C. F. W. Rys, Carnegie Steel Co.

Truck Standards Division

Chairman, Wm. P. Kennedy, Consulting Engineer
W. H. Allen, B. F. Goodrich Co.
B. B. Bachman, The Autocar Co.
Geo. D. Carpenter, The White Co.
H. D. Church, Packard Motor Car Co.
C. E. Clemens, Perfection Spring Co.
J. E. Hale, Goodyear Tire & Rubber Co.
John Younger, Pierce-Arrow Motor Car Co.
Russell Hoopes, Hoopes Bros. & Darlington, Inc.
Robert McA. Lloyd, Consulting Engineer
C. T. Myers, Timken-David Brown Co.
A. C. Schulz, Locomobile Co. of America
Harlow W. Waite, Revere Rubber Co.
E. R. Whitney, Commercial Truck Co. of America

Chain Division

Chairman, F. L. Morse, Morse Chain Co.
Warren J. Belcher, Whitney Mfg. Co.
John R. Cautley, Peter A. Frasse & Co.
Herbert F. Funke, H. F. Funke & Co.
J. C. Howe, American High Speed Chain Co.
H. Shipper Pierce, Link Belt Co.

Engine and Transmission Division

Chairman, W. T. Fishleigh, Univ. of Michigan
A. W. Copland, Detroit Gear & Mach. Co.
L. C. Fuller, Fuller & Sons Mfg. Co.
W. A. Frederick, Continental Motor Mfg. Co.
E. G. Gunn, Northway Motor & Mfg. Co.
H. L. Horning, Waukesha Motor Co.
A. F. Milbrath, Wisconsin Motor Mfg. Co.
W. T. Norton, Jr., Selden Motor Vehicle Co.
W. R. Strickland, Peerless Motor Car Co.
Herbert C. Snow, Winton Motor Car Co.
F. A. Whitten, General Motors Truck Co.

Foreign Co-Operation Division

Chairman, A. Ludlow Clayden, Class Journal Co.
W. H. Allen, B. F. Goodrich Co.
C. C. Carlton, Firestone Tire & Rubber Co.
J. E. Hale, Goodyear Tire & Rubber Co.
B. Martini, Fiat Co.
John Pugh, Rudge-Whitworth, Ltd.
Harlow W. Waite, Revere Rubber Co.

Nomenclature Division

Chairman, K. W. Zimmerschied, General Motors Co.
H. E. Coffin Hudson Motor Car Co.
A. Ludlow Clayden, Class Journal Co.

Automobile Electricity

Locating and Curing Troubles

Part II

Tracing Trouble in the Starting and Lighting System by Symptoms—Short Cuts in the Process of Elimination by Noting Superficial Indications

By J. Edward Schipper

TO detect electrical troubles the infallible rule is:
First—Study the symptoms.
Second—Make the diagnosis.

Since the starting and lighting systems can each be regarded as independent two main divisions are immediately suggested. They are:

A—Troubles in the lighting system.
B—Troubles in the starting system.

Improper Lighting Operation

Improper lighting operation is indicated in three ways:
Case 1—Engine stopped—lights out or dim.
Case 2—Engine running—lights out or dim.
Case 3—Some lamps bright—others dim or out.

CASE 1—Taking up Case 1 with engine stopped and lights out or dim there are two possibilities: A—Battery discharge due to some failure in the battery circuit or in the battery itself or, B—Open circuits in the wiring system.

A-Battery Discharge

Battery discharge as a symptom immediately suggests short circuit. This may be in the wiring of the lamps and their fittings, in the battery, in the circuit breaking or regulating mechanism or in a grounded generator. In fact, almost any part of this circuit is susceptible.

Lamp Shorts—The connections at the lamps sometimes give short-circuits due to poor taping causing bare wires to touch each other. Other things to look for in the lamp connections are loose strands of multi-strand wire bridging across the lamp terminals, grounding of the lamp sockets on the reflector or other lamp parts, defective sockets or other bare wires touching parts of the lamps due to chafing against the lamp or bad insulation.

Switch Shorts—At the lighting and starting switches grounds may be due to bad connections at the switch or a defective switch. Short-circuits at connections in the switch come from bare wires which touch each other, loose strands in multi-strand wires bridging across the terminals, or bare wires touching parts of the switch. Defective switches may have short-circuits in the working parts or through some condition of construction or mounting may be grounded.

Connector Shorts—Short-circuits in the connectors can be traced to either faulty wiring connection or defective connectors. The faulty wiring may have allowed bare wires of opposite sign (*i.e.* plus or minus) in contact, loose strands of wire across terminals or wire connections in contact with metal frame or body giving either a short or ground. Defective connectors have an internal short-circuit which can be readily detected by substituting a perfect connector.

Wire Shorts—Defects in the wire itself are due to bare wire caused by rotted insulation, worn insulation or poor connections. Where wire passes through metal parts the chafing must be noted. A ground to metal parts of the car may be due to worn or rotted insulation or by some metallic connection cutting through the wire insulation.

Battery Shorts—Battery short-circuits may be internal or external. If they are internal the battery itself may be worn out, the plates warped or buckled or a collection of sediment at the bottom of cells due to disintegrating plates although the latter is rare because of the height of the plates above bottom of jar.

External battery short-circuits may be due to acid on the top of the battery forming an electrolyte between terminals; battery terminals sulphated or in contact with top of metal battery box or battery wire connections acid soaked.

Circuit-Breaker Shorts—Circuit-breaker short-circuits may be due to the contacts being held closed by reason of being dirty or worn by a reversal of generator or battery wire connections or by a kick-back of the engine. The circuit-breaker might be grounded also due to defective insulation. A circuit-breaker short allows current to discharge battery through generator at less than charging speeds. After a long run at high speed lights would operate.

Synopsis

Part I—Last Week

¶ *Three fundamental thoughts were established in the first part of this electrical series.*

¶ *First: Continuity of which the circle is the symbol. Electricity flows in a circle or circuit. The circle must be complete.*

¶ *Second: The basic law of current flow. In order that this should exist there must be sufficient voltage.*

¶ *Third: Trouble testing by elimination. The electric circles are divided into a number of arcs by bridging across and these arcs are gone over one by one. These three principles are applied to the lighting, starting and ignition circles.*

Part II—This Week

¶ *Finding trouble by symptoms in starting and lighting systems. Classifying these and indicating the possible troubles for each set of symptoms.*

Part III—Next Week

¶ *Locating troubles by units in starting and lighting. Knowing the unit in which the trouble exists, the possible locations and causes are given in detail.*

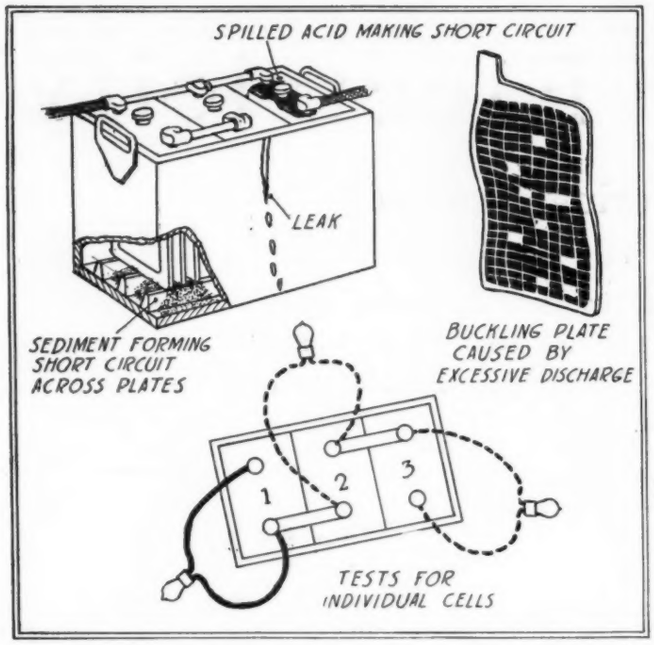


Fig. 1—Some common battery troubles and a simple battery test

A grounded generator can be caused by an accumulation of dust worn from the brushes or a defective insulation of the armature or field coils, located by examination.

A discharged battery can also be due to an overload on the starting or lighting system which may be caused by the leakage of current from short-circuits or grounds as described, by increasing the lamp load through the adding of higher candlepower or lower efficiency lamps, by adding additional apparatus to the lighting system, by the improper operation of the starting motor or by burning the lamps much longer than normal. A discharged battery can also be due to mishandling in winter storage or injured plates or cracked cells.

B—Open Circuits

Open circuits are caused by some breakage of wire or contact throughout the current path. They form a break in the electric circle. Loose connections or sulphated battery terminals should be looked for first. Points especially to be noted are switch terminals, lamp connector terminals and lamp sockets. Burned-out unscrewed bulbs are the most common open-circuit troubles. In connectors look for dirty contact points or no tension in the plunger springs. Bulb bases may not make good contact in lamp sockets or in the switch poor contact may be made. Broken wire at points subject to vibration or where joints have been made is a common open circuit trouble. When the points separate in a contact breaker a wilful open circuit is made. When they will not close at charging speed it should be remedied.

Engine Running, Lights Out or Dim

CASE 2—With the engine running a common ground of trouble with the conditions that obtain when the engine is stopped is in short-circuits. These should be traced in the same manner as outlined above.

Troubles in the Generator

Generator troubles fall under this general head and for this reason it is created. They may be classified under the following heads. Mechanical, field magnets weak, armature winding, commutator brushes and holders, governor, circuit-breaker and regulator.

Mechanical—Under the mechanical head the commutator may be omitted as it is discussed separately. The first cause of trouble is in faulty lubrication which has caused worn bearings allowing, frequently, the armature to strike against the pole pieces. The other cause of trouble is over-lubrication which generally results in rotted brush lead insulation causing a short-circuit or ground at the commutator. Other troubles are electrical, broadly speaking, as well as mechanical.

Fields—Weak field magnets will vary in cause according to whether the magnets are permanent or wound. In permanent magnets the cause is generally due to exhaustion through long use, no keeper used when removing them or magnets reversed when re-assembled. In wound magnets shunt field coil or coils may be grounded due to a water-soaked generator or short-circuited through burning out by running the generator with the battery disconnected. They may also be water-soaked or oil-soaked.

Armature—Armature windings may be burned out or grounded. When burnt out the trouble may be due to a current overload due to improper regulation, a soaked winding or a steady and prolonged return flow from the battery due to failure of the circuit breaker contact points in opening. A grounded armature winding is due to defective insulation.

Commutator—Commutator troubles can be divided into two heads. First, those due to defective manufacture and those due to surface wear or deterioration in service. Defective commutators may be grounded, have a short-circuit between their segments or have loose segments and are generally denoted by sparking at the brushes. Those that have deteriorated in service show a rough or blackened surface due to the following causes: Sparking from worn or short brushes, sparking on account of high mica, cheap brushes, oil collection on commutator surface, loose copper segments, poor contact between brushes and commutator generally due to sticking holders, or poor contact due to weak brush spring pressure.

Brushes—Faults in brushes and brush holders can be classified into five divisions, namely, grounded, poor spring tension, sticking in holder, poor fit to commutator surface and over-heating holders. When grounded it is due to de-

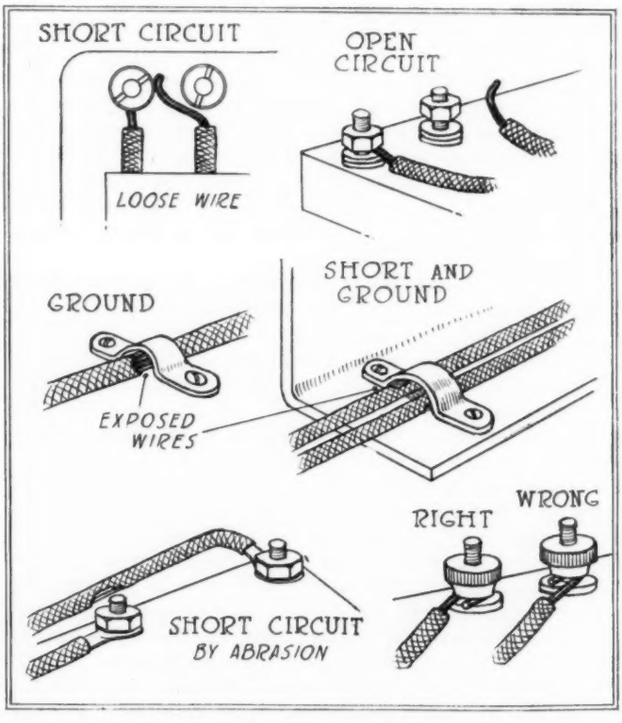


Fig. 2—Typical examples of short and open circuits and grounds

fective insulation or dust deposit. When spring tension fails the brushes are worn too short, the tension is not adjusted or has been thrown out due to heat, or the springs themselves may be broken. When the brushes stick it may be due to binding or from dirt and grease. When the brushes do not fit the commutator surface it is a matter of manufacture. Over-heating brush holders are caused by the sparking of poor brushes or no brush lead connection.

Governor—Generators which have a slipping clutch or governor form of regulation may have troubles in the governor due to a mechanical break, disintegration of weights where lead or other soft metal is used, or a defect between the brake shoes and drum due to a collection of grease or a worn shoe.

Circuit-Breaker—In the circuit-breaker or main contact, as it is often called, there may be a direct mechanical break, a burned-out coil due to current overload or a ground due to defective insulation, a bad adjustment which does not allow the generator to cut in at all or if so at an improper speed or the contact points may be sticking. The latter is due to a mechanical break, disintegration of weights where worn out or dirty contact points, reversed wires at the generator terminal or a backfire of the engine.

Open Circuits with Motor Running

Again under the main head of no lights or dim lights, with the engine running, there is a group of troubles which can be classified under the general head of open circuits. There are eleven of these which are prominent: 1—The generator terminal connections may be loose or making poor contact; 2—The wire connections to the switch may be defective; 3—Defective wire connections to connector terminals; 4—Lamp socket terminals disconnected or loose; 5—Burned-out bulbs; 6—Halves of connectors do not make contact; 7—Bulb bases out of contact with lamp sockets; 8—No connection between lighting switch terminals; 9—Broken wires especially at taps; 10—Joints or places subject to abrasion and 11—Defective connections at the lamp sockets.

Some Lamps Bright Others Out or Dim

CASE 3—Local troubles under the general head of lights dim or out when engine not running, should be first sought for in a partly-discharged battery. When the engine is running, in addition to the partly-discharged battery the

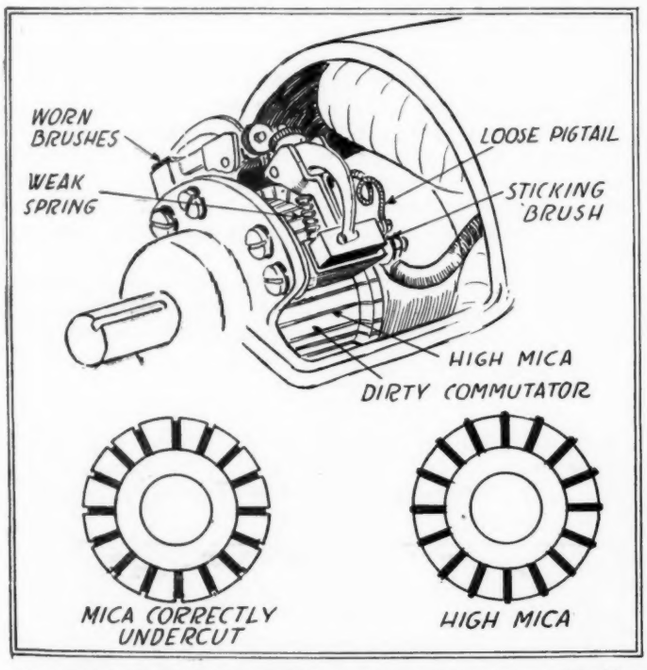


Fig. 3—The commutator assembly and some of its common troubles

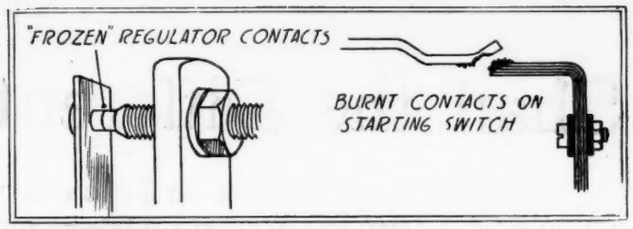


Fig. 4—Two troubles which are not infrequent in lighting and starting systems

circuit-breaker or generator troubles above outlined should be drawn over. If one or more lamps are unsteady and flicker the circuit-breaker troubles should be gone through, the lamp filament may be broken making and breaking contact or a poor contact in the lighting switch, connectors or lamp sockets. With some of the lamps bright and others dim, the circuit on the dim lamps may have a partial short or the troubles explained above for switches, connectors and lamp sockets should be gone through. In single wire installations a ground should be searched for; the bulbs showing dim may be intended for higher voltage, or the bulb may be blackened due to being nearly burned out.

Starting Troubles

TROUBLES in the starting system are indicated in two ways: First, the starter will not crank the engine at all, or second, it cranks it so slowly that proper starting is not given. The first thought in either of these cases is that the battery may be partly or completely discharged or it may be operating at very low efficiency due to very cold weather or some other cause.

Coming back to the general head of when the starting motor will not crank the engine at all there are two causes, open circuits and short-circuits or grounds.

Open Starting Circuits

Open circuits on the cranking motor will be found at the brushes, in loose connections at the commutator starting switch or in the wiring. If at the brushes they may be worn too short or improperly adjusted. They may also stick in the holders due to binding or dirt. Loose connections are obvious, the commutator troubles are the same as those described for generators, the starting switch trouble is nearly always a failure of switch blades to make contact. Sometimes the switches are fused owing to arcing.

Shorts in Starting Circle

Under the head of short-circuits and grounds, these can be divided under the general heads of those in the armature, those in the wiring and those at the starting switch. In the armature or field winding of the motor these may be either burned out or grounded. In the wiring a short-circuit may exist due to rotted or worn insulation or a ground from rotted or worn insulation or from metal screw or cleat connections which cut through the insulation making a ground to one of the metal parts of the car. In the starting switch either a ground or short-circuit may be found due to water soaking or otherwise defective insulation.

Starting Motor Cranks Too Slowly

After the battery condition has been looked after and the starting switch examined for poor contact, the remaining source of trouble is due to a drop in potential caused by a high resistance in the starting circuit. The brushes may not fit the commutator or have proper spring tension or may be poor, giving high resistance. The brush leads may also give poor contact. The same commutator troubles applying to the generator may exist or there may be loose connections in the starting motor wiring which can be sub-divided under the same general heads as the generator troubles.

Shall the Differential Be Abandoned?

Experiments on Trucks and Passenger Cars Show That Eliminating the Balance Gear Is Beneficial in Several Respects—Comparative Tests To Prove the Case

By A. Ludlow Clayden

THE necessity for a differential to allow a corner to be turned without slipping either of the driving wheels has only recently been questioned with respect to automobiles, although street cars and locomotives have always been made with plain, solid driving axles. To-day it seems possible that we have for years been laboring under a delusion, in so far that experiments are showing vehicles without differentials to possess certain distinct advantages.

In 1913 automobile engineers were much interested by the elimination of the differential from the Sunbeam racing cars, and in the races of that year in Europe these machines showed a good tire economy, while the drivers commented upon the remarkably steady steering at high speeds. In 1914 the Sunbeam company abandoned the scheme, giving as the reason the fact that a blowout at high speed on a rear wheel made the steering hard, was actually dangerous in fact.

Meanwhile several small cars appeared on the European market without differentials, notably the Mathis designed partly by E. Bugatti, and the baby Charron. These little cars proved just about the same from the viewpoint of tire wear as though they had the differential, they exhibited slightly less tendency to skid when driving, and much less when braking, while they were exceptionally easy to steer at speeds of 50 m.p.h. Moreover, a blowout did not seem to disturb the steering within the speed range of which the little cars were capable. The most prominent disadvantages were that care had to be taken to use identical tires on both rear wheels, since if one were a trifle larger than the other the tread soon became rough and chafed on the larger casing; and that the cars were difficult to push by hand except in a straight direction. With little cars usually kept in cramped quarters this was a real disadvantage to many owners.

At the outbreak of war this no-differential experiment in the light car world was being watched with great interest, but, of course, nothing has been done since August, 1914.

Truck Tests Made in America

During the past year in America experiments have been made beginning at the other end of the scale, on a series of large motor trucks instead of on light cars. Also there are on the market several substitutes for the differential gear designed to limit the extreme freedom of action which is the differential's worst fault. The most instructive of the tests are those now being made by the Fifth Avenue Coach Co. on several of the buses which are running on routes in New York City, these tests having been commenced at the instigation of A. M. Laycock, chief engineer of the Sheldon Axle & Spring Co.

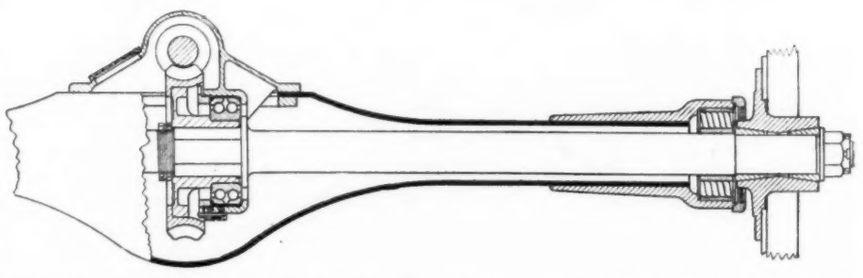
Last fall the differential gear was taken out of one of the buses, the two halves of the casing being locked together, and care was taken to preserve this as a strict secret, none of the drivers being informed.

Concerning the performance of the bus the chief engineer of the company, G. A. Green, reports two things of special importance. The first is that the bus was not troubled in any way by the winter snows, though these caused considerable delay and difficulty with many others, and the second is that the wear on the tires appears to be less than normal. Since the differential was removed the distance run is well over 31,000 miles and the original rear tires lasted 15,495 and 16,000 miles respectively. At the time of their removal they were still a little over half an inch larger in diameter than the limit, there being 1¼ in. of rubber left instead of ⅞ in. This mileage compares well with the average for the buses, as that is about 11,000 miles, but Mr. Green points out that the results are inconclusive because such large variations are noticed in tire durability. He considers it will be necessary to wear out six or seven sets of tires before the tire wear can be estimated properly. It is, however, some small confirmation of the durability shown in the first set, to learn that the second pair of tires are still in operation and are approaching the mileage given by the first pair.

As regards liability to skid this seems to be about the same, except when braking, when it is less, and the only comment the driver had to make of an adverse nature was that the bus seems sluggish on making sharp turns, requiring more throttle opening than usual. Several other buses are now being converted and will be run throughout the present year, Mr. Green hoping to decide the matter completely by next winter.

The most attractive feature of a differentialless axle from the engineer's viewpoint is the opportunity it affords for saving weight. In the experiments made thus far, ordinary axles have been used with the differentials filled with lead, or with the drive shafts taken out and a single shaft, solid from end to end, inserted in their place. If designing an axle to operate without a differential, however, it would be possible to use a shaft strong enough to carry the weight as well as taking the drive, which would mean that the casing for the worm gear would only need to be strong enough to support the driving stresses and would have no weight-carrying function.

In addition to the bus experiments, the Sheldon company has sent out a number of axles without differentials to different parts of the country, and is getting most encourag-



Sheldon worm driven axle with single solid drive shaft replacing the original differential

ing reports from the Middle West and parts where trucks are used largely on sand roads. In loose gravel the absence of the differential may easily make all the difference between ability to proceed and complete stalling. The results of these experiments are also being watched with care, so that much valuable data should be available in a few months.

At first thought the idea of removing the differential sounds absurd, and the first anticipation is that the chafing action on the tires would be very bad, but when the matter is examined in detail the question of tire wear is easily explained.

Slip on Sharpest Turn

For example: The sharpest turn made by an automobile in service is of about 20 ft. radius, and very few turns are made as sharp as this, the majority of deviations from the straight line being of 100 ft. or more in radius. Taking the extreme case, imagine a vehicle with 34-in. tires making a turn at 20 ft. radius. Turning through a right angle the inner wheel will be 20 ft. from the center of turning and the outer wheel 24 ft. 8 in., so the distance traveled by the inner wheel in making the turn will be 15.7 ft. and that covered by the outer wheel 19.3 ft. Now the 34-in. wheel covering these distances will, if rolling freely, make 1.76 and 2.16 revolutions, the difference being 0.4 revolution. It is still a moot point as to which wheel does most of the slipping, under these circumstances, but it is safe to assume that it will be mainly the inner wheel. This slipping, of course, causes some wear.

Action When Braking

Turning to the other case, where a differential is fitted, it is not possible to calculate the slip, but every time a rear wheel passes over a bump and so leaves the road for an instant it is slightly accelerated and is slowed down again by friction when it returns to the road. The amount of acceleration is very small, but what makes the big difference is that the slipping caused in this way is going on during the whole time the vehicle is running, whether straight or on turns, whereas the solid axle causes slipping on turns only and prevents the acceleration effect. If one wheel is off the ground, the other being in contact with it maintains the speed of revolution of both wheels constant.

The reason that the solid axle reduces the tendency to skid when braking is that either rear wheel must continue revolving if the other is turning. If one wheel rests on a wet patch and the other is on dry road, that on the wet can be made to lock by a light application of the brake. Directly a wheel ceases to revolve and begins to slide it is useless for controlling the direction of the vehicle, it merely takes the path along the road which offers the least resistance, and variations in the condition of the surface cause the locked wheel to try to follow a tortuous path. If the other wheel is locked also the rear end of the vehicle will have no sense of direction, whether the axle has a differential or whether it has not. When one wheel is locked and the other, being on dry road, is not locked, then the latter is liable to be pulled out of its path by the gyrations of the former, but when both turn together, at the same speed, as they must do with the solid axle, then both keep their sense of direction and maintain the straight course. It is easy to see why the solid axle enables snow or sand to be taken without trouble, and the braking question is merely a reversal of the same argument.

The ideal, of course, all other things being equal, is to have a differential for making sharp turns and not to have one for 99 per cent of normal running. Thus there is a great deal to be said for a modified mechanism which will strike a mean between the two extremes. Whether the solid axle, or a modified differential comes to be accepted practice, or whether the old differential will emerge from the time of trial in unaltered form is a matter for speculation, but it appears that 1916 will stand out in automobile engineering as the year when the differential question was settled.

Improving on the Cotter Pin

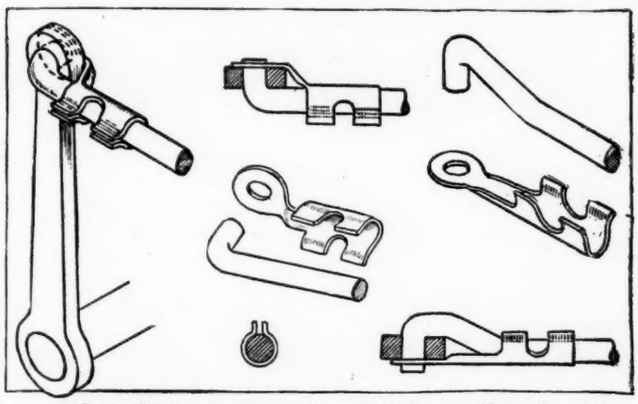
New Device for Securing Rod Ends Simpler and More Effective Than Old Method

IT is seldom that any new invention affects the simpler mechanical devices. Only at rare intervals does anyone discover a better way of doing some very simple thing than the way that has been used for years. A novelty which will replace the cotter pin for many of its applications; which is more effective and no more costly is thus an invention of no small importance, as it cannot fail to find a scope of application far exceeding the automobile industry.

Such a device patented by C. S. Pelton of the Perfection Spring Co., Cleveland, Ohio, is now being put on the market by the Burns & Bassick Co., Bridgeport, Conn. Primarily the "Pelton clip" was designed to connect the throttle-operating rod to the throttle lever. The usual method is to bend over the end of the rod, drill it and place it through the lever hole, afterward putting in a cotter pin. The Pelton clip dispenses with the drilling, guards against rattle, is equally cheap and is easier of application.

The illustrations render the idea perfectly clear. The clip is made from sheet steel, punched from strip and with the tongues bent up into a nearly parallel position. To apply it, it is simply put in place and the ends of the tongues brought together with a pair of pliers. The end of the clip can be set to take a bearing against the throttle lever, so preventing rattle, and the clip is easily detached by opening the tongues with a screwdriver. As shown, there are two patterns, one with the clip bent out to clear the lever end, and the other, a straight clip for cases where the end of the rod is cranked.

Of course, the throttle application is far from being the only one. Throughout a chassis there are many other places where the Pelton clip is greatly the superior of a cotter pin, and in agricultural machinery there is an enormous field.



Pelton clip in straight and cranked form. Note the end view which shows lips which are closed by pliers or separated by screwdriver for detaching the clip.

Motor Trucks and Trailers Aid Mexican Expedition

¶ *The above illustrations give some idea of the thoroughness with which the army authorities have gone about securing sufficient motor transport for men and supplies on the punitive expedition of American troops pursuing the Mexican bandit Villa.*

1—Enlisting men for the chauffeurs' division. Applicants are always more numerous than the positions to be filled. All are eager for a trial.

2—One of the heavier types of Troy trailer used for the more weighty supplies.

3—A Jeffery quad loaded with general supplies for the army at the front, rations, tents, ammunition, etc.

4—A new Jeffery quad stocking up with gasoline directly from the tank car.

5—Ford ambulance with two stretchers, one placed above the other on the side opposite the driver. This car also draws a trailer carrying two stretchers.

6—Twenty-three of twenty-eight Packard light service trucks ready for shipment fourteen hours after the second order was received from Washington for trucks for army service in Mexico.

Burman Killed in Corona Grand Prize

Car Overturns at 100 M.P.H.—Mechanic Killed—Others Injured

CORONA, CAL., April 8—Robert Burman, celebrated as Wild Bob throughout the world as an automobile racing driver, was mortally injured and his mechanician, Eric Schrader, and a track policeman were killed here to-day when Burman's Peugeot blew out a tire at 100 m.p.h. in the ninety-seventh lap of the Corona Grand Prize. The car skidded upon a culvert and crashed past two telephone poles into a group of spectators, several of whom were seriously injured. Burman died at the Riverside Hospital at 5:55 this evening. His skull was fractured, several ribs were crushed and both legs broken in several places. Mrs. Burman was with her husband when he died, having rushed to the emergency hospital ahead of the ambulance that took him to the operating room.

The late Robert Burman

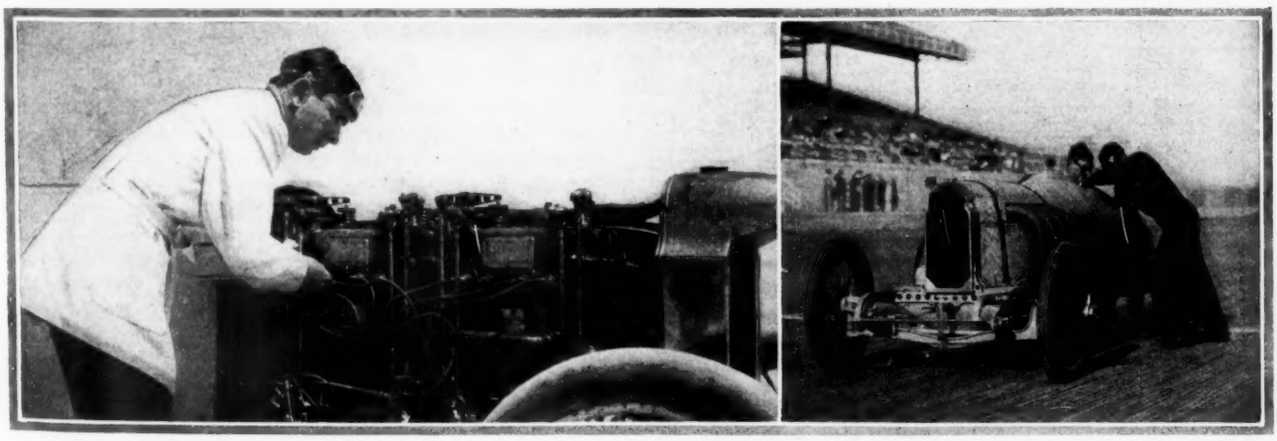
When the accident occurred Burman was six laps behind O'Donnell, who was leading, and was driving at top speed to make up some of the time he lost at the pits during his frequent stops for tire changes and mechanical troubles. Struggling under these handicaps, Burman drove with his characteristic fearless abandon now in first place, now in last and then back in the lead again, drawing frantic plaudits from the crowd as he forced his mount on, lap after lap, ever striving against adversity in his fight for first place and the $5,000 purse.

On March 25 Burman won the Exposition cup race at San Diego, Cal., sending his Peugeot over the 50-mile course at 52:14 m.p.h.

Burman, frequently characterized as the world's speed king, was born in Imlay City, Mich., April 22, 1884. Burman tested the first automobile ever manufactured by the Buick Motor Car Co. and then entered the employ of the Jackson Automobile Co., becoming head tester. While thus employed, a resident of Jackson, Mich., built a freak racing car and invited Burman to enter into a contest with him. This Burman did and won his race by more than a mile. This early success decided him to enter the racing field and he induced the Jackson company to allow him to enter one of their cars in a 50-mile race at Detroit in 1906. He won against a field comprising practically all of the leading racing drivers in the country. This was the beginning of his fame as a racing driver. His next experience was at St. Louis, where he drove twenty-two and one-half hours of a twenty-four-hour race, winning by 82 miles. With the Buick cars, which he drove later, Burman won so many races that he attracted attention all over the world. His most notable victory in 1910 was the winning of third place in the Grand Prize at Savannah, his car being the first American-built machine to cross the tape.

Burman held five records on the straightaway regardless of class. They are: 1 kilometer, 0:15.88; 1 mile, 0:25.40, and 2 miles, 0:51.28 made in his Blitzen Benz at Daytona, Fla.; the other two, made in the Buick Bug at Jacksonville, are: 20 miles, 13:11.92, and 50 miles, 35:52.31.

Burman also held the class B speedway record for stock cars of 301 to 450 cu. in. for 250 miles, 4:38:57.40. He held the quarter-mile speedway record made in his Benz at Indianapolis in 0:8.16; 1 kilometer in 0:21.40; ½ mile, 16.80; and 1 mile, 35.35. He also held six circular dirt track records, 10 miles, 8:16.40; 15 miles, 12:47; 20 miles, 16:25.60; 25 miles, 20:28.80; 50 miles, 40:57.80; and 75 miles, 1:08.56.



Two views of Burman. At the left he is tuning up his Blitzen Benz prior to breaking the world's record for the mile, and at the right as he was starting in the match race between his Benz and De Palma in the twelve-cylinder Sunbeam at the Sheepshead Bay Speedway on Nov. 2, 1915 in two heats, the average speed in one being 111.97 and in the other 113.86 m.p.h.

Essentials of Racing Engines

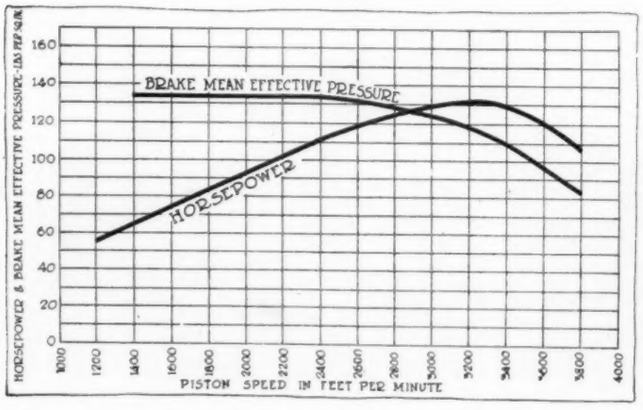
Intimate Engineering Details of Wisconsin Racing Motors Described and Discussed by Mid-West Section S. A. E at First Professional Session of Section

CHICAGO, ILL., April 8—Last night the first professional session of the Mid-West section of the S. A. E. took place, the paper of the evening being given by Charles H. John, president and general manager of the Wisconsin Motor Co., Milwaukee, Wis. Mr. John gave a general talk on the racing work done by his company, including the fullest details of the engines with which the Stutz cars were so remarkably successful last year. The paper is reprinted almost in full below. Some of the details mentioned by Mr. John were given in THE AUTOMOBILE for Oct. 14, 1915, but there is a good deal of additional information particularly as regards lubrication and valve gear.

Model Aeroplanes Make Flights

Another feature of the meeting which aroused equal enthusiasm was the exhibition of model aeroplanes by the Model Aeroplane Club of Illinois. Preliminary to the exhibition, Arthur Elton Nealy of the Model Aeroplane Club presented a short paper in which he brought out the value of the model aeroplanes in the development of aviation with particular reference to what the models were doing in the development of automatic stability in full size machines. He stated that at the present time the full size machine so far as its stability and guidance was concerned is 90 per cent operator, and 10 per cent machine, but that in the models which carry no operators, automatic stability and guidance must be inherent in order to make successful flights inasmuch as no operators, of course, can be carried in the midget aeroplanes.

In the demonstrations of the flying ability of the models which followed, Mr. Nealy succeeded in proving that model aeroplanes can be made to have a great degree of inherent stability and guiding power. About a dozen different types of models were flown within the confines of the assembly hall and the young men who manipulated seemed able to make them guide themselves with almost human intelligence. The models looped-the-loop and did similar stunts which have been featured by aviators. The most striking exhibition was that of a model hydroaeroplane which arose from a pan of water 2 ft. by 3 ft. in size, flew out over the audience, looped-the-loop and returned to rest in the pan.



Horsepower and brake mean effective pressure curves plotted against piston speed for Wisconsin racing engine.

Mr. John's paper follows:

In the high speed motor the underlying principle is to reduce the weight of the reciprocating parts to a minimum for safety. By reducing the weight of these parts the inertia forces are reduced, which are the causes of excessive vibration at high speeds and which waste much power by reason of the extra friction. This is accomplished by using better materials for the connecting rod and piston. Chrome vanadium connecting rods, heat treated, of exceedingly light weight, and pistons of special aluminum alloy, reduced the inertia forces to a minimum and greatly relieved the stresses upon the connecting rod as well as on the bearings. Alloy steels were also employed for the crankshafts, bolts, gears and other parts subjected to excessive strains. The microscope is used to determine the proper heat treatment and the scleroscope to get the proper hardness. Valve springs had to be made of vanadium steel and tungsten steel was developed for valves. Bearing metals are given special study, as under the great pressure and high speeds ordinary metal would burn out in a short time. The law of bearings, however, would prove inadequate without an efficient oiling system.

Racing, and naturally, also, high speed engines, have compelled the engineers to give the question of correct lubrication their minute attention. The result of their labors was the introduction of high grade motor oil, and this, to some extent, has eliminated a great many motor troubles. In these high speed motor tests it was also discovered that oils, when exposed to very high temperatures, would deposit a sediment in the oil chamber. This was largely eliminated by cooling fins in the piston, also cooling fins on the crank base. In a test made with one of the large Wisconsin six-cylinder tractor motors, we found that running the oil through cool water, which was made possible on account of our forced feed oiling system, increased the efficiency nearly 10 per cent. This taught us a valuable lesson, and we now are cooling the oil on our tractor motors by means of a jacketed inlet manifold. This manifold has double duties, to-wit: cools the oils and at the same time heats the incoming gases.

Lubrication Most Important

I attribute a great deal of the success of Wisconsin motors in racing annals to their perfect oiling system, which in all of our motors is the forced feed type. The oil is contained in a separate oil sump and is forced by a gear pump through ducts to the main bearings and then through holes bored in the crankshaft to the connecting rod bearings. The oil under pressure is forced from each side of the connecting rod bearings and is thrown in all directions. In this way oil is splashed against the cylinder walls, pistons, push rods and into pockets over the camshaft bearings. Oil is also fed directly over the timing gears by means of a copper tube leading from the main duct. The oil then drains back into the sump through a strainer and is there ready for another journey. This, in the opinion of many engineers, is the most efficient and economical oiling system yet introduced. In a 10-hr. continuous test recently made at our plant on a high-

speed motor, the consumption of oil was slightly over 1/100 pint per hp. per hour.

Long Stroke Is Advantage

As the amount of power available from an engine depends upon the volume of gas consumed in a given time, it was evident that by using smaller cylinders and allowing the crankshaft to revolve faster, the same amount of power could be obtained as from a larger engine revolving at slower speeds. Extensive trials also proved that the long-stroke motor was capable of greater speed and increased power over the short-stroke motors. This lead to the development of the present 300 cu. in. racing motors which I will endeavor to describe more fully.

Selecting the Steel

It is hardly necessary for me to repeat the success of Harry Stutz on the speedway, in the road races and in the transcontinental runs. I wish to add, however, that all of the races up to the year 1915 were run with practically our stock T-head motors. Directly after the Indianapolis speedway races of 1914, we concluded that the foreign invaders had carried off enough of our good gold, and we agreed to build four motors for Mr. Stutz that could successfully compete with the foreign racing machines. Our engineer, A. F. Milbrath, had sketched out one of his ideas which met with Mr. Stutz's approval, and we immediately started to work on these motors. We had heard wonderful tales of a new steel made in Belgium, called B. N. D., with a wonderful tensile strength, and we concluded that we had to get this steel. Orders for crankshaft and connecting rod materials were placed at once, but alas, war was suddenly declared, and we were compelled to look for other channels of supply. We decided to use chrome-vanadium steel, which had given us such excellent service. This was of American make, and the greatest care was exercised in the selection of all materials. The scleroscope and the Brinell tests were resorted to, and in addition, to make sure that the material was correct, physical tests and chemical analyses were made. After heat treatment, specimens were taken from the various parts and examined micro-photographically to insure the granular structure being right. With these precautions, we were able to demonstrate that America can produce steel equal in strength and stability to anything produced abroad, and to-day American products are at a par with any of European extraction. Our tests convinced us that we had the proper material, so we rushed through a single motor in order to give it a thorough test.

Gives 131 B.H.P. at 2950 R.P.M.

When the first motor was completed and put on the test stands the results were quite satisfactory, but no extraordinary power or speed were developed. A careful study of lubrication and principally ignition was necessary before we were able to get results. When all of these difficulties had been satisfactorily solved, we obtained some very astonishing figures, in fact, they were far above our expectations. This motor of 296.81 cu. in. capacity developed 131 b.hp. at 2950 r.p.m., and was at once shipped to Mr. Stutz, whose chassis was ready for the motor, and trials were at once started. It was shown by these trials that this engine was developing extraordinary power, and Mr. Stutz at once notified us to proceed with the other motors. Three cars were built and the performance of these three cars has been among the most remarkable in automobile racing. In the 500-mile Decoration Day races at Indianapolis, these three cars started, and all three finished well up in the running, a record never equalled before.

I do not have to enumerate all the victories which Harry Stutz won, as they are matters of history. Foreign engineers have as a rule taken their defeat manfully, and are giving America due credit for designing and building a motor capable of such wonderful achievements.

American engineers have shown that they are equal to their European cousins, American car builders can build just as good a chassis and American steel makers can produce just as good materials, and perhaps better, than the famous steels of Belgium.

I-Head Is Efficient

It is well known that a gasoline poppet valve engine follows certain lines, and these lines are fixed and cannot be altered. The valve-in-the-head type has been recognized as the most efficient construction, and it is only a few years since the four-valve superseded the two-valve type. It is not necessary for me to argue the merits of the four-valve type, and neither do I wish to enter into a dispute as to the authorship of this type. I have read of an English engineer claiming he orginated this idea, and then again the French claim it, and so do the Italians. We also find that very nearly all of the European racing cars are using four valves, and I will just mention the Sunbeam, Humber, Straker-Squire, Vauxhall, Peugeot, Delage, Schneider, Mercedes, Isotta-Fraschini and Fiat.

Dispensed with Valve Cages

In all of these there is a certain similarity, especially in the combustion chamber, as it is necessary to employ the semi-spherical shape if one wants to obtain large valve area. It was also found necessary to dispense with valve cages, and so we find valves fitted directly in the cylinder head with ample waterjackets surrounding them. These essentials in motor construction were established, and it was now the ambition and aim of the automobile engineer to get the greatest amount of power out of a given cylinder volume for the greatest length of time. The fact is established that we took their own weapons and defeated them squarely, and we are proud of our record.

Aluminum Barrel Crankcase

It may be of interest to members of the section to hear the details of construction of this motor. The aluminum crankcase of the Wisconsin racing motor is of the barrel type, with rather a large opening on the bottom, but built extremely rigid. The bottom cover is provided with cooling ribs. The main bearings are ball-bearing, with 1-in. diameter balls, and held in place by means of cast steel retainers. The motor is three-point suspension, the forward end supported by a trunnion bearing on the steel front cover plate and the rear carried by a cast-steel arm firmly bolted to the crankcase.

Dimensional Details

The crankshaft is 2¼ in. in diameter and the material employed is chrome-vanadium steel, double heat treated. It is made in two pieces, the two halves being held together by a large bolt. The cylinders are block cast with ample waterjackets around the barrels, as well as around the valves. There are two inlet ports, as well as two exhaust ports, and the valves, which are 1¾ in. in diameter, are seated directly in the cylinder head. The valve guides are of cast iron, but the valves are of high tungsten steel. Two valve springs are used, one inside of the other. This eliminates the danger of the valve dropping in on the piston should a valve spring break.

One Rocker for Two Valves

A single camshaft is used, which operates the valves by means of short fork-shaped rockers, one rocker operating two valves. The camshaft is built up and stepped spacers are employed between the cams and bearings, which are ball-bearing. The camshaft is driven by means of spur gears

½-in. wide. These gears are also of chrome-vanadium steel, heat treated and run on ball bearings. The gears are inclosed in an oil-tight aluminum housing. A single gear drives the water pump, oil pump and magneto. The front cover plate is of steel as is also the flywheel. The connecting-rods are tubular, made from a solid forging of chrome-vanadium steel. A 1-in. diameter hole is bored through the entire length, making a very light, but at the same time very rigid rod. The bearing end has four bolts, and is bushed with bronze, Fahrig metal lined bearings. The upper end is bushed with a solid bronze bushing with a ⅞-in. hole for the piston pin. This pin is bored taper, the thicker part remaining in the center of the pin and gradually tapering towards the outside.

Pistons of Magnalium

The pistons are made of magnalium and weigh 12 oz. each. Only one groove is cut into the piston, and this is cut wide enough to hold four rings 1/16-in. wide. The piston pin is neither fastened to the rod nor to the piston, but is free to float, and is held in place by means of a wide steel clip, liberally perforated with holes. The head of the piston is supported by ribs radiating from the center and uniting with a lug which extends through a slot cut into the connecting-rod at the top of the piston pin. Two sets of spark plugs were provided for each cylinder, and a two-spark Bosch magneto was used. The weight of this motor is 600 lb.

Pressure Feed Lubrication

The oiling system is of the pressure type, our standard gear pump being used. The oil is carried in the sump and drawn from here through a strainer, after which it is forced through the oil leads to oil rings carried on the crankshaft. These oil rings carried the oil through holes drilled in the crankshaft to the connecting-rod bearings, the overflow from the bearings forming a spray which lubricates the pistons, wristpins and main ball bearings. Oil troughs are also provided under the rods and the rods are fitted with scoops so that a double system is employed for the lubrication of the big ends. The excess oil is drained back into the sump. A separate oil lead was taken from the pump to lubricate the overhead camshaft, a small stream of oil being directed onto each cam. The ball bearings carrying the camshaft are lubricated by splash from the cams. The excess oil from the camshaft housing returned to the oil sump through the gear housing at the front end of the motor, also through a return tube at the rear end.

Maximum Power at 2950 R.P.M.

The motors developed their maximum power at about 2950 r.p.m., or 3200 ft. piston speed per minute. At this speed the brake horsepower was 131. During the races the average speed of the motors was slightly less than above, or between 2600 and 2700 r.p.m., at which speed the horsepower was 124 to 128. On the test stand the motors were run up to 3500 r.p.m., at which speed the horsepower dropped slightly. The maximum pressure on connecting bearings, due to the pressure on pistons, was about 600 lb. per square inch.

The mean velocity of gas through inlet manifold was 2950 r.p.m., the speed of maximum power was 175 ft. per second, and through the valves 215 ft. per second.

The maximum mean effective pressure in the engine, figured back from the brake horsepower, was 132 lb. per square inch. This pressure was maintained from about 1400 r.p.m., to about 2200 r.p.m. At 2950 r.p.m. it was 118 lb. per square inch.

Discussion Obtains Timing of Engine

In opening the discussion on the paper on American racing engines, Chairman F. E. Place, vice-president of the Buda company, congratulated the section on having the opportunity to learn the construction and design of an engine which has made such wonderful records on speedways and in road races and has shown that America can produce engines and cars which can show their heels to the fleetest productions of Europe. He felt that the paper was particularly timely in that it was presented just before the beginning of a new racing season and in a center where racing interest is most acute.

Use 40-Lb. Valve Springs

George W. Smith, engineer of the Thos. B. Jeffery Co., inquired as to the weight of the valve springs employed and as to the method of holding the wristpin in place. In reply Mr. Milbrath stated that the valve springs were capable of 40 lb., and that the wristpins were fastened neither to the connecting-rod nor to the piston, simply floating within the piston and being held in place by a steel ring around the piston, which, however, acted in no sense as a piston ring. In illustrating this, Mr. John exhibited a connecting-rod, wristpin, and piston from one of the racing motors.

Features of Two-Cycle Racers

Mr. Marr, formerly engineer of the Amplex, mentioned some features of the two-cycle racing car with particular reference to the Amplex which competed in the first 500-mile race at Indianapolis. He stated that the engine was almost the stock motor, but was lightened as to its reciprocating parts as far as possible. The weight of the connecting-rod was cut down but the lightening of the piston was limited by the extreme pressure over the piston head. He said that the motor developed 86 hp. at 1650 r.p.m. for 4 hr., and showed its maximum torque at 1100 r.p.m., and its maximum crankshaft speed was 1800.

Temperature of the Oil

Robert J. Broege, engineer of the Buda company, asked as to the temperature of the oil in the Wisconsin racing engines, to which Mr. Milbrath replied that the temperature ran to 150 deg. on the test stand, but was not so high when running on the track on account of the cooling effect of the air, and that the running pressure decreased slightly with the speed and the power that the motor was developing.

Asked by E. A. Turner, vice-president of the Northwestern Expanded Metal Co., as to the valve timing of the racing engines, Mr. Milbrath stated that the timing was no different from that of the stock Wisconsin motor. He said that the timing was as follows:

Inlet opens 10 deg. after upper dead center.
Inlet closes 50 deg. after lower dead center.
Exhaust opens 50 deg. before lower dead center.
Exhaust closes 10 deg. after upper dead center.

Asked by F. C. Mock, research Engineer Stromberg Motor Devices Co., as to what cylinder volume the 75 ft. per minute velocity of gas was assumed, Mr. Millbrath answered that this assumption was at full cylinder volume. He stated that the oil temperature, he believed, was lower in the force-feed system employed in the engine described than it is in the splash systems on account of the cooling ribs, but no comparative tests have been made by him.

Fuel Economy Possibilities

Asked as to the economy of the engine, Mr. Milbrath stated that while no tests were run to determine the economy at moderate touring speeds, he believed that it would prove very efficient on account of the almost complete opening of the top of the cylinder by the valves, and also the hemispherical shape of the combustion space.

He stated that the compression space was figured at 20 per cent of the total cylinder volume, and when turned over by hand, a compression of 95 lb. per square inch was shown. The weight of the flywheel was 70 lb. The spark advance at maximum power was about 30 deg.

The History of the American Automobile Industry—25

Four-Cycle and Two-Cycle Engines on a Commercial Basis—Development of the Modern Motor Vehicle Fostered and Made Possible by Gasoline

By David Beecroft

WITH the epoch-making development of the Otto four-cycle engine of 1876, and the development of the Clerk two-cycle engine in 1878, the great principles of explosion engines were laid down, and both type of engines, the four-cycle and the two-cycle, were placed on a commercial basis. Since then the development has been that of improvements, but the basic principles as laid down by Otto and Clerk have been continued. This thus brings us to a dividing line in the history of the combustion engine. Up to this time it was the solution of the great problem of making the explosion engine a commercial success. It was a constant working in the dark. It was because of the efforts of many inventors that the final results were accomplished. Otto worked thirty-seven years, and others were working an equally long time. The solution was started by de Rochas in 1862 and was completed by Otto.

Gasoline of Prime Importance

Before carrying on the practical development of the automobile from the days of Otto and Clerk up to to-day it is necessary to digress here and introduce a few chapters on the development of the petroleum industry. Without the lighter fuel now known as gasoline, it is questionable if the motor vehicle would have developed as successfully as it has. Fortunately a copious supply of gasoline has kept pace with the development of the industry, and it is impossible to estimate the influence the fuel situation has had on the development of the motor.

It is an interesting coincidence that while the first oil well was drilled near Titusville, Ohio, by E. L. Drake in 1859, the principles of the four-cycle gas engine were laid down by de Rochas in 1862, just three years later. As previously stated, de Rochas had correctly conceived the necessity of four-cycles of operation in a gas engine as we know it to-day. It is particularly fortunate that practically at the same time the great gasoline industry should have been started.

Formerly a Waste

At the beginning of the automobile industry as a commercial business, this fuel was a waste because there was not sufficient use for it. Kerosenes of several different grades were on the market, and some of the lighter grades were practically what is known as gasoline to-day. They were regarded as extra hazardous, and were prohibited in some States lest they be used in kerosene lamps and cause damage. Gasoline was then used quite a little for private gas plants, and the early experimenters could hardly help obtaining a fluid that evaporated easily and burned cleanly. Its hydrogen content was proportionately quite high as compared with the carbon content, and the flame rather resembled an alcohol flame than a kerosene one. These facts explain how early American inventors succeeded by simply dropping the liquid on the inlet valve.

The History of Petroleum

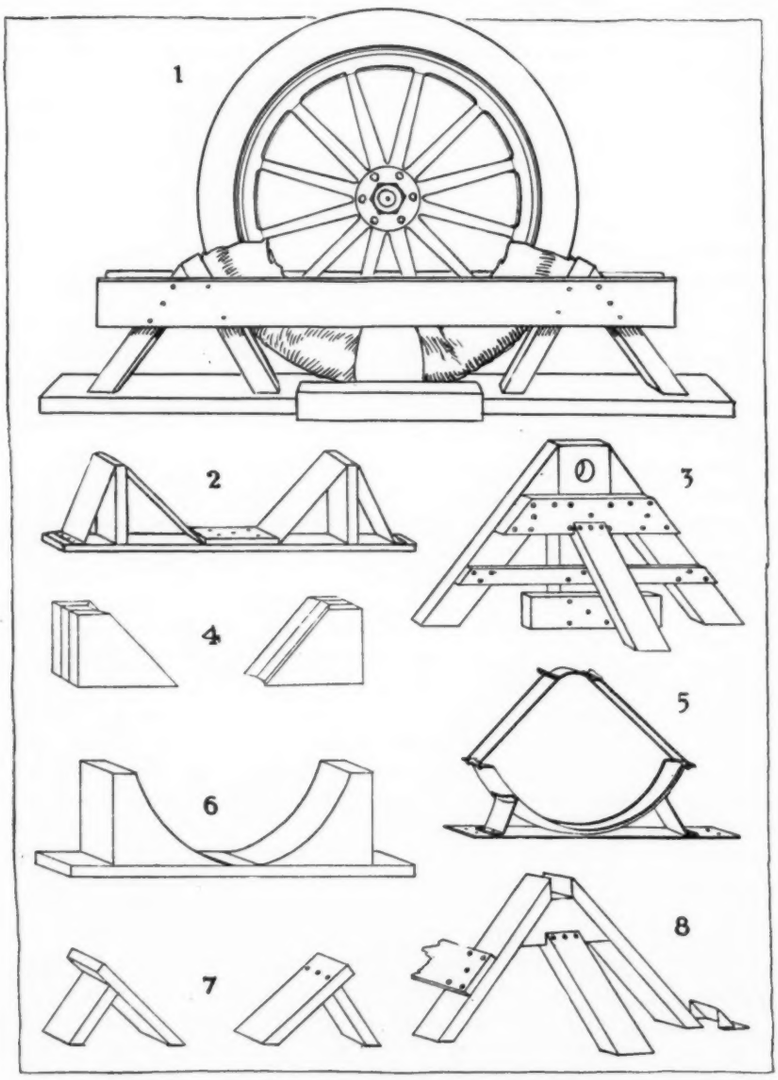
While the practical development of the gasoline industry dates from 1859, it will be appropriate here to show that petroleum in its varied forms has been in constant use for at least 3000 years and perhaps longer.

The production of petroleum runs back beyond the beginning of writing, and its story reads like a tale from Fairyland. Few things have had such a wide use during so long a time as has petroleum and its allied products. As a cosmetic for beautifying, a medicine for internal or external use to lessen pains and rheumatisms and embalming preservative, its use reaches from ancient Egypt to the present. Equally long is its use as a cement for bricks and stones or a slime for rendering crudely-built boats water-proof. The walls and buildings of Nineveh and Babylon, the tower of Babel and Solomon's temple, just as modern roads and building foundations, made use of petroleum products. Josephus tells us that the tower of Babel was constructed of burned brick and bitumen that it might not admit water. Herodotus says of the building of Babylon that large bricks were burned in furnaces and closely laid "using for lime or mortar hot asphaltas or bitumen." He also describes it as being obtained from the valley of a small river Is, a tributary of the Euphrates. That valley of pitch is still supplying its products to the surrounding country, and more recent writers describe it as containing many noisy springs and the pitch as used for "the staunching of boats."

Securing Shipping Security

Methods for Blocking Automobiles in Freight Cars Vary Widely—Evolution is Toward Simple and Cheap Types —V-Blocks Were Source of Many Damage Claims

THE question of blocking automobiles for freight shipment is a very important one for both shipper and railroad, for improper blocking may cause serious damage and pecuniary loss. For twenty years, manufacturers have been trying to solve the problem of proper loading, and in the early beginnings, there were many makeshifts, such as beams of wood spiked across the car floor, one touching the front wheels and the other supporting the back wheels of the automobile. Later, solid pieces of wood cut on an angle were used on both front and rear of each tire, being fixed to the floor with large spikes, and side strips made from boards 1 in. by 2 in. in thickness, and from 6 in. to 12 in. in width were nailed along each side. Boards were placed beneath these blocks as base boards, and the whole formed what was known as a cradle. There were many variations of this method, some of which still exist to-day, and all being rather crude and expensive. Some of these blocks were made from solid wood, and others were constructed from two pieces of wood, the latter being known as "V" blocks. Some manufacturers using solid blocks endeavored to have them curved so that they would conform to some extent with the curved face of the tire.



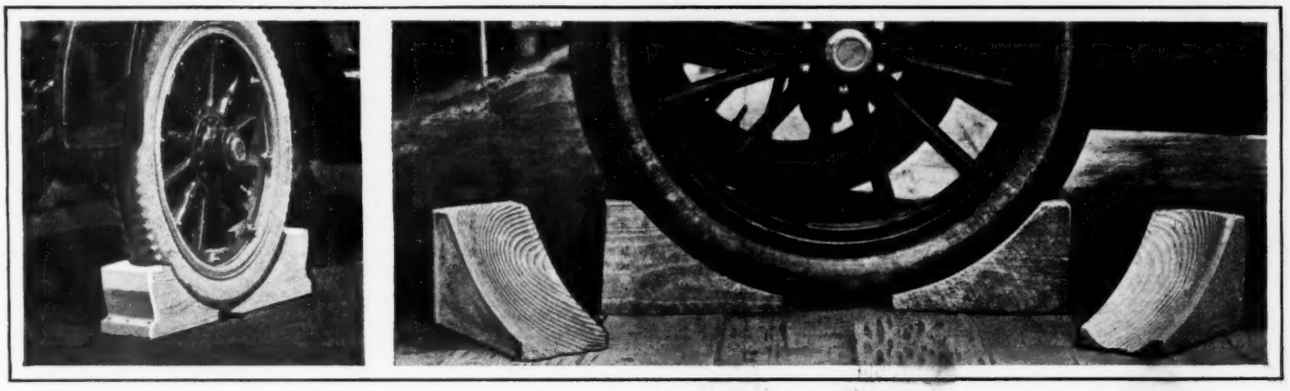
1. Application of the two-piece V block. 2. Block of sheet steel stretched over wood blocks. 3. Hub horse used by Franklin. 4. Grooved block made from three pieces. 5. A costly metal blocking system. 6. Solid curved blocks mounted on board. 7. Two piece A block. 8. Studebaker axle horse used on front axle only

It was believed by some of the railroads, and quite a number of shippers, that the obvious difficulties and objections to the "V" block and other straight faced blocks then in use could be overcome by using a metal block. The idea was that a metal block could be returned to the factory and used over and over again. Several were invented and tried out. The most popular principles employed were those of the stamped block, which was grooved to keep the tire from moving sideways, and to do away with the necessity for side strips. This metal block conformed in shape to the wooden blocks then in use. The stamped block, however, proved impractical. It was found that, in drawing the metal, it would crystallize, and the weight of the motor car with the constant jolting to which it was subjected, would crack the blocks and cause them to sag and fall.

The Hub Horse

About ten years ago, the H. H. Franklin Mfg. Co. developed a type of loading arrangement known as a hub horse. This horse was so constructed that the hub of the automobile could be rested in a hole made for the purpose, the four horses suspending the car from the floor. Studebaker, about two years ago, adopted a similar device. The effect of the horse, however, is to bring the entire weight on the axle. The automobile must be fastened so rigidly that there can be no play, and it becomes practically a part of the freight car. Thus, any blow received by the freight car becomes a direct blow to the machine. The wheels being suspended, the car does not receive the cushion of its tires.

Most of the blocking systems mentioned above cause chafed tires, and the claims from this source of damage alone aggregate thousands of dollars. The railroads from time to time have made an effort to overcome this trouble, and about 1911, the Santa Fé published a booklet entitled "Suggestions for Loading Automobiles," the main suggestion being that all tires be wrapped with a double thickness of burlap around the lower third of the circumference, and that the front wheels be tied down with two tie straps instead of one.



Left—Evans block curved to fit tire and with "heel" to receive nails. Right—Grimm block which is similar but without heels

This booklet concludes with the statement that the Santa Fé has adopted as a standard a straight faced grooved block which prevents the front wheel from turning on the steering knuckle, and therefore, eliminates tire chafing to a considerable extent.

V-Blocks Wrong in Principle

In the light of present achievement, this old Santa Fé block seems very crude indeed. The Santa Fé grooved block was so expensive that it never came into general use and, whereas there was a great variety of different methods used, the most popular up to 1913 was the V-block made from either two pieces or three pieces of lumber. These V-blocks were wrong in principle, crude, and were the source of constant claims for damage, but they were cheap, and a number of companies used them for this reason.

In 1913, Charles G. Grimm, an experienced wood worker of Palatka, Fla., conceived the idea of combining the curve and the groove in the same block. After months of experimenting, he applied for patents in the United States and Canada for the Grimm automobile shipping block, which was so constructed that it fitted exactly the contour of the tire, the wheel resting easily and evenly along the whole length of the groove. The groove of this block holds the wheel perfectly straight, and the shoulder or freeboard on the block prevents any chafing against the burlap blocks or sideboards. The smooth surface of the groove prevents any chafing of the tread, and makes it unnecessary to wrap the tires with burlap, or to face the blocks with burlap or carpet, as recommended by the Santa Fé for use with the old fashioned block. The Grimm block which is manufactured in Palatka, Fla., by the Florida Woodenware Co., from long leaf pine and cypress, was first used by the Cadillac company, and then it gradually superseded the other methods of loading, until in the latter part of 1915, thirty of the larger automobile manufacturers were using it exclusively.

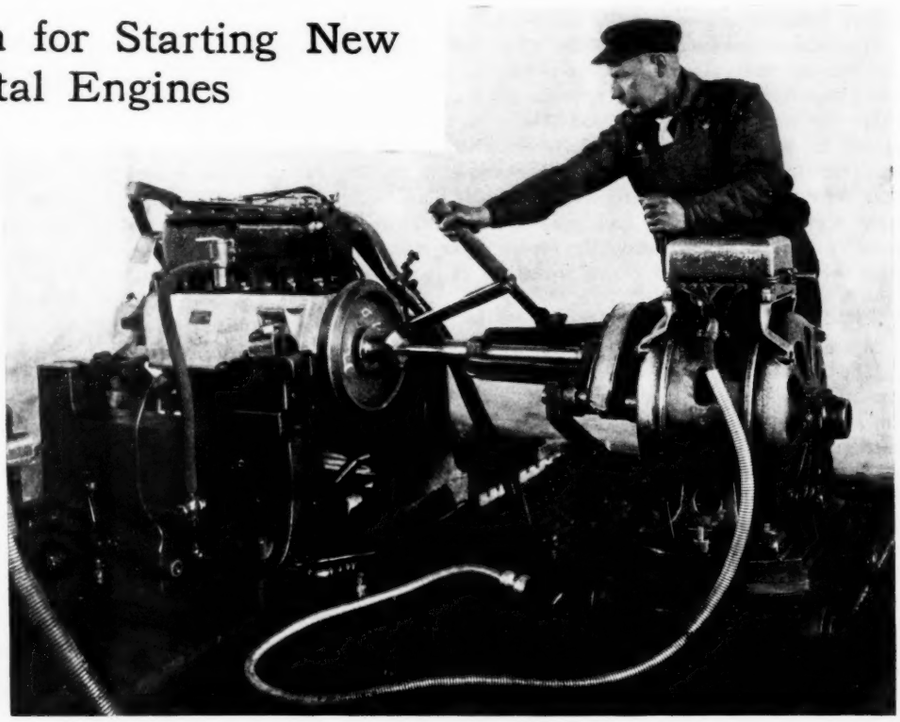
In December, 1915, Edward S. Evans, associated with the Florida Woodenware Co., Detroit, applied for a patent on a similar block which is now being used extensively.

The chief difference between the Grimm and the Evans blocks is the "heel." The Grimm block is the more simple as the back of the block is a plain, perpendicular surface, but the Evans block uses a heel, which is incut in the back of the block, so giving a surface through which the nails can always be driven at a uniform angle and proper depth into the car floor.

Cranking System for Starting New Continental Engines

THE Continental Motor Co. has succeeded in effecting a considerable economy of time and labor by the installation of a powerful cranking motor for use in their large engine test shop. The electric motor is mounted on a carriage that runs on a track behind the rows of engines on the test blocks. At proper intervals there are floor plugs to supply the necessary current.

To permit the ready engagement of the starter, the shaft can be swung into any position till the clutch comes opposite the end of the crankshaft; the operators right hand controls this jaw clutch and the left hand the motor controller. It is stated that this starter can have 250 new engines running in less time than in starting twelve engines by hand.



The FORVM

PUBLIC MUST BE PERSUADED TO ACCEPT KEROSENE AS A FUEL BEFORE IT CAN BE ADOPTED—AIR COOLED AND TWO-CYCLE MOTOR ADVANTAGES

Advantages and Disadvantages of Kerosene as a Fuel

By B. H. Pomeroy, M. E.

I HAVE been following the various writings upon the question of kerosene for a fuel for combustion motors and am more than amused at the way some go about telling how to get the required results.

It is not the booming of kerosene in a combustion motor that is important, but getting the public to accept and use it as a fuel, as it has its advantages and again its disadvantages.

Arguments Pro and Con

Advantages are: high explosive force, freedom from carbon on plugs and cylinders and greater mileage, gallon for gallon and less oil required for lubricating of cylinders.

Disadvantages are: for persons who fill tanks on cars and slop it on the cushions and floor mats, leaving a stain that soils the clothes; but this could be overcome if the general public would adopt kerosene as a fuel. The mere fact of converting it into a perfect explosive gas is no great task, as the writer is a firm advocate of kerosene as a fuel and has been using it for four years as such with perfect success and finds no trouble whatever, and when you say kerosene burners to people, they simply say, "Gasoline is good enough for me," and this is one reason why the kerosene motor is no further ahead. There have been several firms which have branched out on kerosene and advertised to some extent, but they seem to have abandoned the proposition. But why have they abandoned it? Simply because the public has not taken kindly to it.

The carbureter of to-day is not adapted for kerosene, but a very simple device can be made. The one which I have on my own car to-day—and have used for the past four years—has given entire satisfaction with no more bad odor or smoke than the present grade of gasoline gives. I am using a model L Schebler 1¼-in. carbureter with my attachment, using the regular throttle, but with changes in the air valve and venturi. I can idle from 60 to 1200 r.p.m. without the least sign of loading up and can see no waste or overflow from carbureter when I stop the motor after running for an hour on forced suction or closed throttle.

Kerosene a Logical Fuel

My motor is easily started, almost always on a quarter turn of the crank, but cold weather makes some difference, not enough to speak of. I use my car 365 days per year and I am at a loss to understand why others do not adopt kerosene as a fuel. The kerosene proposition is probably like a great many good inventions—held up on account of insufficient confidence of men with capital to help out the inventor. In my case, I have worked with kerosene and experimented with it since 1900, when I made the first worm-drive rear axle and had it on exhibition in New York. Then I was discouraged by the majority of automobile men, who said the device was out of the question because of friction; but to-day, what about it? The same thing applies to my kerosene-burning motor. There are several good kerosene motors not of the hot bulb type. Secore, for one, gives perfect combustion, and why not others? Simply because the inventors are afraid to come to the front with them, on account of having their inventions swept from them.

When the automobilist gets to using kerosene for fuel as a regular thing then we will see the price go up, the same as gasoline. As long as oil is controlled by a few firms this will invariably be the case.

I am not finding fault with any particular firm, but think and know that this proud and ingenious nation of ours should find a way to corral this everlasting increase in price of fuel. I do not cherish the idea that I as one should be classed as a traitor for keeping my invention as others of my class are doing, but when the time is ripe and the general public is willing to accept, I am ready to unfold my invention. Of course I desire to benefit my brother man as much as I can, but when one has spent several years at perfecting a thing of this kind, he desires to see something done with it, and not have it shelved and the public go on in the same old way.

Air Cooling and Two Cycles for Higher Efficiency

By Chas. E. Duryea

THE several articles and editorials on conservation and increased efficiency in your recent issues are most interesting. The public badly needs more of this education. Mr. Sargent's plea for a higher compression with low throttle instead of lower compression is certainly along the right lines. His suggestion to vary the closing of the inlets and thus secure a cutoff action is good, but it is not clear how we can prevent the driver from using the most powerful mixture and the latest cutoff possible in order to get maximum power and thus get compressions too high for the mixture, resulting in pre-ignition with its pounding and disadvantages. The automobile does not go into the hands of trained engineers, but is driven by everybody and must be so simple and foolproof that it cannot well give trouble, or be tampered with in any way.

Two-Cycle Fuel Economy

One of the reasons why I look forward to a perfected two-cycle is the fact that it employs constant compression and so may make better and more efficient use of its fuel when throttled than can the usual four-cycle. Mr. Sargent's figures showing the disposal of the fuel energy are very interesting but hardly correct for the average automobile engine. The energy expended in work is probably under 20 per cent, as shown in next column, the engine friction is probably nearer 10 than 5 per cent. The radiation and

exhaust are probably somewhat higher than 25 per cent and the jacket loss probably lower than 45 per cent.

Why Not Compound?

The best way to increase the work energy would seem to be by compounding. Nowadays buyers seem to like more cylinders and by using one-third of them as second expansion affairs we could save the need for mufflers and add 20 per cent or more to the work figures. Steam engine practice indicates that it is more economical to use low-pressure cylinders rather than attempt to expand to the limit in the high-pressure cylinder. Compounds heretofore made have been water-cooled, whereas if they had been air-cooled the efficiency would have been much higher because the heat would have been more largely retained for work instead of foolishly used to boil water.

The big loss being out through the jacket and radiator it would seem apparent that air cooling needs adoption. It is perfectly easy and safe to run an air cooler with its walls at 360 to 500 per cent, which is two to three times the usual waterjacket temperature. This means that very much less heat escapes to the cooling system and accounts for the superior showing made in efficiency contests by the air-cooled cars. The first look for the man looking for low fuel costs should be toward the cars which use their fuel for propulsion rather than for water boiling. Two and three times the mileage per gallon is equivalent to cutting the fuel price in two and three with the added advantage that some fuel is left for the other fellow.

Car Weight Important

Car weight is another consideration in the line of conservation. Comfortable riding is a matter of design and springing and not of weight. While it is true that with a given unsprung weight the heavy body rides more easily than the light one, it is also true that the light body does not need the heavy wheels and axles to carry it and so is not affected by the same unsprung weight. Buggies and cycles went through this improvement from heavy to light with great gain. The automobile will do so just as soon as buyers refuse to take heavy cars. Motorcycles and buggies weigh very little more than their maximum loads. When will we get automobiles approximating this ratio? A 4000-lb. car is three times as heavy as needed to carry seven people and costs twice as much to run, not to mention added tire and other expenses.

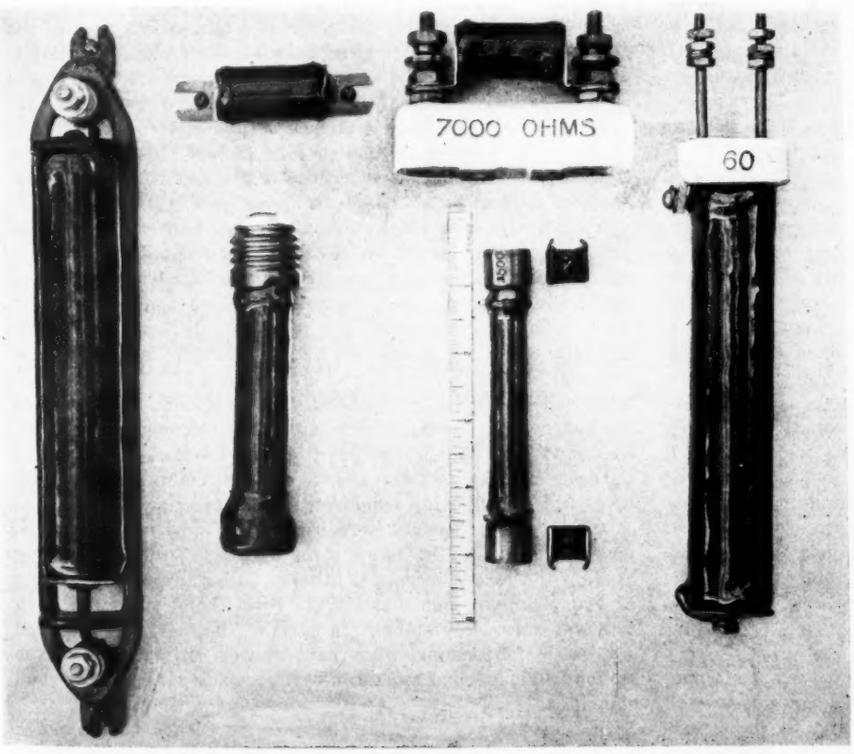
Compact Ward Leonard Resistance Unit

Adaptable to a Wide Variety of Circuits and Can Be Furnished Up to 10,000 Ohms on One Layer of Wire for Standard Conditions

A COMPACT unit of high resistance and of moderate current carrying capacity has been brought out by the Ward Leonard Electric Co., Bronxville, N. Y. The resistance material, which is illustrated herewith, is made up of units of wire of practically zero temperature co-efficient, wound on porcelain tubes and covered with a vitreous enamel. The resistance wire is embedded in a substance which expands and contracts at the same rate as the wire does itself within the limits of ordinary electrical usage.

This harmonious expansion and contraction prevents adjacent turns of wire from closing together and short-circuiting, which would in turn cause a change in the resistance of the unit and might cause burn-outs in the circuit.

The vitreous enamel in which the wires are embedded and by which they are entirely covered, protects them from the atmosphere. As the entire wire is hermetically sealed in this way it cannot deteriorate owing to the action of the atmospheric moisture or other corrosive elements. The coating of enamel over the wire is thin and is a good conductor of heat, thus keeping the temperature low by dissipating the heat.



Compact Ward Leonard resistance units which are rust-, water-, fire- and dust-proof

By the practically zero co-efficient of the resistance wire is meant that its resistance does not alter with changes of temperature and this is an important factor in practical installations of all sorts.

Units Are Strong

Mechanically the resistance units are strong, being compact, non-abrasive, rust-proof, water-proof, fire-proof and dust-proof. The terminals are sturdy and the connection between the resistance wire and the terminal leads is embedded in the vitreous enamel which preserves the joint against depreciation. The shapes of the units are shown in the illustrations. These illustrate units arranged to be screwed into lamp sockets, fitted with ferrules for fuse clips equipped with angle ends, or for wall mounting. Any of the units shown can be furnished with resistances as high as 10,000 ohms on one layer of wire.

Automobiles and Trucks Big Assets To German Army

Enable Rapid Transference of Reinforcements Between Various Battle Fronts—Constructional Points Brought Out By War Service—Coping with Tire and Fuel Situations

By E. A. Langdon

ACCORDING to enthusiastic Germans, three factors have been responsible for the successes of the Kaiser's armies in Poland: Von Hindenburg, the big guns and the automobile. It would be difficult to choose any one of these as the supreme factor, for without the wonderful mechanical equipment, even Germans admit, the field marshal could not have achieved what he did. This applies not only to the later campaign and the struggle for Warsaw, but even more to the early stages of the eastern fighting, when East Prussia and West Prussia were considered to be seriously endangered by the millions of Russian soldiers.

It is claimed that the plans for the battle of Tannenberg, for instance, were largely of a makeshift nature, in that the Russians moved into Germany along somewhat different lines than was expected of them, and that millions of German troops had to be rapidly transferred from more southerly points of the frontier to the north. This could never have been done without thousands of automobiles, in spite of the fact that several lines of railroads, very efficient in a military sense, run parallel with the line of forts Koenigsberg-Thorn-Marienburg. Likewise, it was due to the automobiles that every kind and quantity of artillery required could be brought to the battlefield in time to defeat the Russians. Of course, the automobile operations were by no means restricted to the preliminary work of the battle, but as positions shifted, the motor equipment was always kept working hard.

The First Big Demonstration

This was the first demonstration on a large scale of the tremendous military value of the automobile to Germany. The work, consisting of wholesale movements of troops and cannon and ammunition, was repeated with relatively small modifications in the several battles of the campaign of the fall of 1914. At the same time, cars enabled the Austro-Hungarian troops to make the best of their strategic retreat through Galicia, in the face of Russian armies which were in vast numerical superiority. It was the unfailing supply of enormous quantities of munitions which made it possible to hold the Carpathian passes against the Russians thrown into them regardless of losses. Finally, automobiles constituted, to a large degree, the driving force which turned the Russians from the Carpathians and Galicia into Poland, ending the first and opening the second great stage of the eastern campaign.

An Automobile Railroad System

The second stage consisted largely of the advance, sometimes rapid and sometimes slow, of the united Teutons toward Warsaw, and after the conquest of that city, to the Brest-Litowsk line. Most of this advance was made in a country of soft soil, very poor in the way of roads, while most of the railroads were destroyed by the retreating Russians wherever they had time to do it. Fortunately for the invaders, the solid railroad beds could not be destroyed in the short time given to the retreating enemy, and this made possible the creation of an "automobile railroad system," in which the cars followed the lines of the railroads. The latter radiate from Warsaw toward the Russo-German frontier, being also constructed, largely, from a military point of view. Hence, concentration along these radius lines toward Warsaw was relatively easy and automobiles were able to do their best. Of course, a very great amount of their work was done over roadless ground, and here, too, the value of the cars was tested and proved. But, in a general way, the hardest work for automobiles in the east was done during the Carpathian campaign, when the machines had to plug through snow and mud several feet deep and often had to be raised and got under way.

Unique Car Uses

It stands to reason that cars served all kinds of work for which they had never been intended. The writer remembers, as specially striking, the instance of a car jacked up with its rear axle geared to the generator of a wireless telegraphy outfit, and another case, where the motor actuated the dynamo of a huge searchlight. One of the most interesting emergency uses to which a car was put was when the motor of one of the large siege guns bombarding one of the Russian fortresses became inoperative. In a very short time the crankshaft of a nearby automobile had been geared up to the shaft driving by the electric motor of the gun and controlling the position of the latter, so that the gun could continue to operate until a thorough repair could be made.

On the western front, automobiles also found plenty of work. This applies especially to the fighting in the Champagne and Vosges, where the net of railroads is more sparse than in Northern France and Flanders, and where at times most violent fighting went on. Several hills commanding the surrounding ground, such as the well-known Hartmannsweilerkopf, changed hands as often as a score of times during the war, and the party on the offensive of course had to bring up troops and fighting machines under better cover than that of the strategic emergency railroads serving a position which is securely held. In more than one case, all the fighting against the forces on such a hill was in vain, until the supply of heavy ammunition was cut off from them, when the position was carried by storm. In some of these storms, armored cars with small-calibre guns participated, and in spite of the obvious difficulties of such a hill climb made surprisingly good showings.

One might even say that Germany succeeded where motor cars could operate and did not succeed where they failed. Wherever there was a possibility of quickly attaining a posi-

tion required and suitable for effective attack, this possibility was realized through the work of the automobile. It was *the alliance with the automobile* which made the 30.5 and 42 cm. guns as effective as they proved in scores of siege operations, including Liege, Antwerp, Maubeuge, etc.

Field Repair Depots

Mention has already been made of Factories Behind the Front, as the repair shops are called. In the east these shops, of which there are a number, are from 150 to 200 kilometers behind the front, while in the west they are much closer to it and in better communication therewith. The chief reason for this different situation is that the positions in France and Belgium are considered by the invaders to be absolutely impregnable; to support this argument they point to several gigantic attacks which left the German front almost unchanged and which were stayed by an army of much smaller number than those attacking the lines of the Teutons. Needless to say that automobiles played their part in these very efficient defense acts, transferring reserves and materials from one point to the other, according to local requirements.

Steering Gears Weak

As to the technical information which the war work of the motor car brought to the light, one of the most striking facts discovered was the general weakness, relatively speaking, of the steering gear. The steering equipment seemed most apt to give way under the terrible stress of operation. From 10 to 20 per cent of the repairs necessitated by work, not military or fighting damage, had to be made on steering equipment. The simple explanation of this fact is that under the strenuous conditions of military service crystallization of this hard-working part sets in much more rapidly than in ordinary work, where a car may be kept on fairly decent roadways most of the time.

Radiators Protected

One trouble much complained of is the lack of protection of the radiator. The slightest injury of the honeycomb developed very quickly into serious trouble since motors are always working at top capacity. Whenever possible, radiators are being protected by cheap but strong devices, such as wide-mesh, heavy-wire hoods. It is said that German trucks, constructed with a view to getting government subsidies for their purchasers, were better protected from the start than American trucks, which latter proved excellent in a great many respects. The Germans frequently praise the relatively low weight of American machines which permits greater fuel economy, a most important factor in Germany to-day. In this respect, American cars average much better than European makes.

Clearance a Factor

Another point which had not been foreseen sufficiently was ground clearance. Automobiles had of course to make their way over the most unimaginable ground and many a car was delayed for hours or, worse yet, disabled for weeks. Here, too, light and cheap American products gained laurels.

With the natural irregularity of supplies that accompanies war operations no matter how well managed, maximum carrying capacity for fuel and oil of paramount importance. The tanks, however, proved almost invariably to be hardly sufficient. Hence, whenever automobiles go to repair shops, small tanks are replaced by large ones, which latter are generally of aluminum, iron and copper being too costly for this kind of equipment at the present time.

Aluminum in Demand

Apropos of the increasing use of aluminum, there is a very noticeable tendency toward a reduction of dead weight in German automobile construction. Alloys of the nature of magnalium, a combination of aluminum and magnesium, which is both light and strong, are becoming very common, and German engineers and metallurgists do not tire of emphasizing the great help which the war rendered to their work by forcing the rapid development of many questions of this kind. There exist a great many new articles which enter into the manufacture of automobile parts, and several developments of paramount importance are said to be in the status nascendi. One of these, it is rumored, is an alloy composed mainly of aluminum to which has been added a metalloid element, and the mixture is said to closely resemble steel in its elastic possibilities.

Another novelty, or rather a series of innovations, exists in the fuel line. Let no one be surprised if after the war Germany will use almost no gasoline for her automobile motors. Not only has the use of benzol increased tremendously, but alcohol has become at least as common for motor service, and the very design of automobile motors has been adapted to the character of these novel fuels.

Synthetic Rubber Used

It has been mentioned in a former article that synthetic rubber is now a practical article in Germany. Seeing that Germany's imports in this very valuable and important substance, namely, para rubber, became practically nil with the outbreak of the war, the plans for making the material in a synthetic way were rapidly put on a commercial basis, and almost all new tires are now made of this material. Germans have no doubt that after the war they will soon increase their output of synthetic rubber and that they will be able to do so at such a low price as to introduce in a short time huge quantities of the material in the world. German technologists in particular are very optimistic regarding this development and more than one has been heard by the writer to predict for the rubber industry the same fate as that befell the indigo industry decades ago, when synthetic indigo was first brought out by the Germans and in a short time destroyed completely the trade in the natural East Indian product.

The Patent Situation

This incident, of which there are a considerable number of parallels, points to an important evolution in German industry. Until a short time ago, the Empire recognized what was known as secret patents, claims and specifications to inventions, which were filed by the government, but not published, yet protected the inventors' rights. Only the growing power of liberal business interests disposed in time of this rather undemocratic institution; but Germans now believe that the war will be followed by commercial competition so keen as to almost amount to a trade war against Great Britain and possibly America, and they will do their utmost to protect national business interests, even at the expense of some free institutions. It is to be supposed that, if these plans realize, the Germans will offer to the world after the war numerous new chemical products the compositions of which will of course be determinable by analyses, while the process of manufacture will be kept utterly secret. The Germans argue that such a course will be more beneficial to them than to patent their inventions abroad and run the risk of losing their title thereto, either temporarily or permanently, through war or other extraordinary event, as was the case with German patents in England. The advantage of secret, over the open patent method, German engineers claim, is well demonstrated by the thermit welding system, which requires aluminum in powder form for doing the welding work; but the method of producing the powder is not patented, yet kept strictly secret. Such a system of business, involving secrets of manufacture and trade, can, according to the Germans, be successful in Germany, though perhaps not everywhere else; since, as the Germans never tire to state, the German businessman, engineer and workman are ruled by a Berufsethik

(ethics of vocation) which forms as essential and important a part of their morals as the decalogue.

Germany Adopts Production

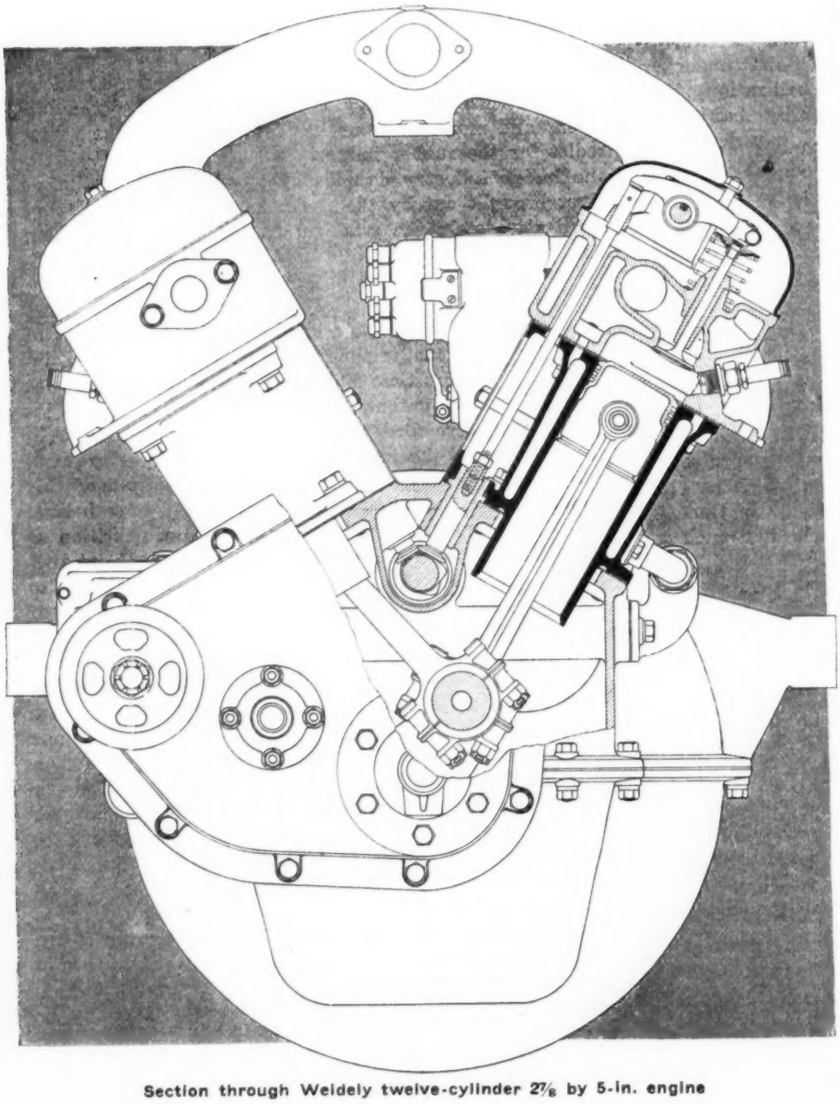
It may not be amiss to state that plans are under way for the organization of one or perhaps even several enormous motor manufacturing corporations which are to produce cars upon the myriad basis as it exists in the American industry. Germans thereby not only expect to curb the imports of American-made cars, which steadily increased during the six or eight years before the war, but they intend, in course of time, to become the chief power of supply for the international automobile market. For this, Germans state, they are indebted to the lesson Americans gave them during this war by exporting countless automobiles to Europe. Germany seems to believe that sooner or later there will be a chance for her also to determine history by commercial methods.

One more fact should not be forgotten in this connection. About one year ago, it looked as if the coming of peace would bring in time a wonderful chance for American industry exporting its products to Germany and the countries of her allies. For months, however, negotiations have been under way between these powers to complete, with the re-establishment of peace, a customs union, enabling them to buy industrial products from German and Austrian industry and to obtain agricultural products cheaply from the Balkans. Germans are inclined to believe that such a combination could soon be extended to include Italy and Scandinavia; and if these plans materialize only to the extent of one-half their scope, this will mean a huge obstacle in the way of any American industry figuring upon exporting to Central Europe after the war.

With peace expected in England by the end of next year, and in Germany considerably before that time, it is very important that Americans be prepared for the opportunities which the end of the war will bring. If rightly handled, these should be fully as profitable, if not more so, than the war has proved to industry of the Western Hemisphere.

Weidely Engine on Two Chassis

INTRODUCED toward the end of last summer, the Weidely twelve-cylinder engine has since been fitted to many Pathfinder cars and to a fair number of the new H. A. L. which made its maiden appearance at the New York show. The Weidely engine is comparatively small for a twelve, being 2⅞ by 5 in., giving a piston displacement of 389.5 cu. in. The overhead valves are operated by push rods from a single shaft with twenty-four cams, the tappets being of mushroom type. Adjustment is given by a screw in the end of each rocker, secured by a pinch screw, and this design makes the adjustment very accessible.



Section through Weidely twelve-cylinder 2⅞ by 5-in. engine

The crankshaft is 1⅞ in. in diameter and has three bearings, while it is drilled throughout for oil supply to the lower end connecting-rod bearings. The latter are placed adjacent on each crankpin and are stiff drop forgings.

Cast-Iron Pistons

For the pistons cast iron is used, with three narrow rings, and to reduce the spread of the cylinders the foot is carried down into the crankcase for a distance equal to three-quarters the length of the piston. There are four cylinder blocks, but the detachable heads are not thus sub-divided. In the sectional cut it can be seen that the intake manifold is duplex, carrying the water also. The water pump is located on the right side of the crankcase midway of the length, being driven in tandem with the generator. For the left blocks of cylinders a water pipe is taken across the engine passing through the crankcase at the center.

Camshaft Separately Oiled

For oiling the lubricant is fed from the gear pump to the three main bearings and is caught in centrifugal gutter rings on the crank webs as it escapes. From these gutters it is led into the crankpins and then taken up pipes to the wristpins. The camshaft is contained in a separate tunnel which gets a separate supply of oil, the overflow going to the front end of the engine where it lubricates the timing gears. There are two screens, one a sheet of fine mesh covering the whole of the bottom part of the crankcase, and the second still finer, being a smaller affair on the suction side of the pump.

The Rostrum

70,000 Miles at 3½ Cents per Mile

EDITOR THE AUTOMOBILE:—Perhaps the following figures will interest your readers. They give actual costs of operating an automobile for some 70,000 miles covering a period of three years, one man doing this driving and two cars worn to a point where it seemed best to sell them and buy new rather than spend more money for repairs.

In January, 1913, we bought a Ford runabout for one of our traveling representatives. In twenty months, or until September, 1914, he drove this car 37,550 miles at a total cost of operation of $1,256.72 or $0.0334 per mile. At that time we sold the car, purchasing a new Ford runabout. Adding the depreciation to the old car, the total expense was $1,566.72, making the total actual cost per mile $0.0417.

The new car was run 31,619 miles up to the present. We have just purchased a third runabout.

The total cost of operating the second car for eighteen months was, $817.43 or $0.02574 per mile. Including the depreciation the cost was $1,046.43 or an actual total cost per mile of $0.03309.

On the second car the itemized operating costs per mile were as follows:

Gasoline	$0.0082
Oil	0.00205
Tires	0.00784
Repairs	0.00495
Storage	0.0027
Total	$0.02574

You will note the cost of operating the second car was considerably less than that of the first car. We think this can be charged altogether to the skill of the driver who had never operated an automobile up to the time he began driving the first car purchased. Being entirely unfamiliar with the care of an automobile, he did not know how to handle it to get the best out of it. For instance, once he allowed the oil to get sufficiently low and a bearing was burned. After operating this make of car for some 70,000 miles, he has become something of an expert and gets the very most from his car all around in tires and repairs, oil, gasoline, etc. His gasoline mileage aside from the winter season averages 23 to 25 miles per gallon.

In conclusion we might say that he covers all kinds of roads in the three States of Connecticut, Rhode Island and Massachusetts.

Middletown, Conn. G. E. M.

Insufficient Gasoline at High Speeds

Editor THE AUTOMOBILE:—I have an Abbott-Detroit four-cylinder 4½ by 5½ Continental motor which has caused me a lot of annoyance. Every once in a while the motor will backfire at the most critical time, especially when climbing hills and sometimes on level ground when running at a moderate speed. There is a Stromberg carbureter and through the glass float chamber I am positive the gas is there. I cleaned out the whole of the gasoline system. Tried about forty different adjustments on the carbureter without results. Am positive valves do not stick and cylinders are free from carbon. Magneto is a Splitdorf model T and is a rebuilt one from the factory in exchange for the old one. Do not think the trouble is there as the car will run very well most of the time. Found leakage from high-tension wires in metal tube. Took those out and replaced clear of all metal and put in all new spark plugs. Thought I had it but the trouble still shows up. What is it?

2—Please illustrate by diagram distance armature breaks from field of Bosch and Splitdorf magneto to get the peak load. I understand the breaker points separate at this point throwing out the maximum amount of current to coil.

3—I am interested in running on kerosene, and two or three years ago I tried experiments on a Ford with such good results that you could not tell the difference in power. I used gasoline to start and the regular carbureter. I used to coil my feed pipe around the exhaust at its hottest place, thence to the carbureter, as the secret is to get the kerosene well heated before it enters the carbureter. On account of the heat a cork float is not good in the carbureter as it blisters the shellac. This is not practical on short runs as it needs too much manipulation; but on trucks or buses when the engine is not stopped all day it effects quite a saving. I also had a clean engine and as much power as I ever had.

Watertown, N. Y. A. F. W.

—Although you state you have cleaned out the whole gasoline system it seems quite evident that there is a clogging somewhere in the line or else the carbureter is too small. It is evident that you are not getting enough gasoline at high speeds. There is also a possibility that the carbureter air valve sticks open at higher speeds.

2—Your question is not quite clear but it is supposed that you mean to ask the point at which the primary circuit is broken in relation to the position of the armature with regard to the fields. On all magnetos it is the aim to break the primary circuit at the peak of the current wave and this is when the armature winding is cutting the greatest number of lines of force in the magnetic field. Exactly what this position is will depend on the arrangement of the magnets.

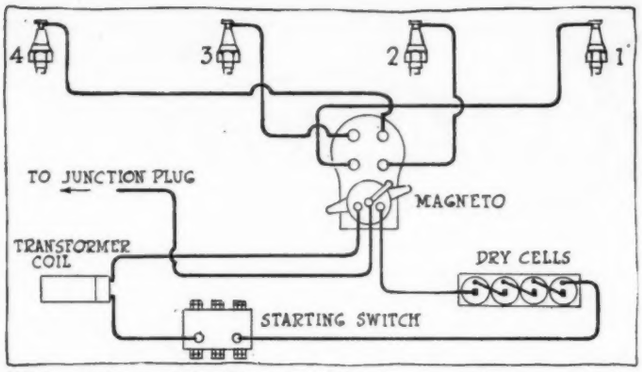
3—It seems to be quite practical to run on kerosene even with the ordinary type of carbureter as long as sufficient heat is added to assist the vaporization. The trouble of course is largely in being able to start the motor on this fuel.

Wants Information on Coey Flyer

Editor THE AUTOMOBILE:—Kindly publish information on adjusting the steering gear of the Coey Flyer 1916 model, so as to take up the backlash or play in the steering wheel. I have tightened up the nut on top of gear housing without avail, the wheel still has about 6 in. play.

The clutch thrust bearing on this car has given considerable trouble. The balls are ¼ in., nine in number and are contained in an ordinary ball retainer, such as is used in bicycles. This retainer has broken several times, allowing the balls to break and lose out. I have had to replace balls and retainer three times, during which time car was only driven 1600 miles.

2—What makes the motor keep on firing after being switched off? It appears to me to be the mixture. The carbureter is the Stromberg with only one adjustment, a small



Wiring diagram of the Maxwell car showing connections and circuits

knurled nut, on top of the float chamber. The motor seems to run best when this nut is opened about five or six turns to the left, but it consumes too much fuel. I can only get about ten or twelve miles per gallon of gasoline. Give a suggestion on adjusting this carbureter and state how many miles per gallon I should get out of this car, with the proper adjustment.

East Palestine, Ohio. E. M. G.

—The ring gear you refer to has two adjustments: On the top of the worm and on the side for the sector gear. In all probability you have taken up the end thrust on the worm but did not disturb the adjustment of the sector. It is also advised that you examine the steering arm as any steering arm has a tendency to work loose, owing to the great strains to which they are subjected. A little lost motion at any point in the steering gear means considerable at the wheel.

The clutch thrust bearing to which you are referring is being replaced gratis by the Coey company as the first few cars which were sent out had thrust rings which were not up to specifications. Since you have replaced these frequently there is a possibility that you have neglected to place light grease in and around the bearing, which is the only method of lubricating this thrust bearing.

2—Presumably this will be owing to carbon in the motor. It cannot be due to the carbureter if the ignition is switched off. Have the cylinder removed and all carbon thoroughly scraped off. You will probably find that cleaning the motor will enable you to operate the carbureter on an adjustment which will give a leaner mixture and therefore cure the present heavy consumption.

Float Valve Seat Is Damaged

Editor THE AUTOMOBILE:—Will you please tell me how to grind in the float valve of a Schebler carbureter that leaks slowly; a new needle has not cured the trouble. The needle has a steel cone on a brass stem.

Scranton, Pa. D. R. C.

—It is evident that the float seat valve has become damaged and this should be repaired with a float valve reseating tool. If the carbureter is sent to the manufacturer or to the nearest distributor, which in your case is the Manufacturers' Supplies Co. of Philadelphia, they will be glad to reseat the float valve seat in the bowl so that the valve will seat properly and eliminate flooding trouble.

This would have to be done with a special tool in order to get a satisfactory job, so it is better to either send the carbureter to the manufacturers in Indianapolis or to the agency in Philadelphia.

Ignition System of Maxwell 25

Editor THE AUTOMOBILE:—Please explain ignition system on 1916 Maxwell 25.

Uniontown, Pa. H. G.

—Ignition on the Maxwell car is furnished by a Simms high-tension magneto assisted by dry cells and transformer coil to facilitate starting. The ignition system is of the dual type, having a small non-vibrating coil which is attached to the frame of car. This coil is unaffected by either moisture or heat, and being non-vibrating there is nothing to get out of order or require any adjustment.

Four dry cells are used in connection with this system, and care must be taken to connect them correctly. This is most important, and the wiring diagram should be consulted before disconnecting or connecting any of the ignition wires.

The switch operating the battery circuit is in connection with the starting switch and when the starting pedal is depressed, thereby throwing the starting motor into operation, the current flows through the switch, coil and magneto. As soon as the engine starts or the starting pedal is released, the circuit is automatically disconnected and the engine runs on the magneto. It is readily apparent that the operation is extremely simple with the additional advantage that it is impossible to unconsciously leave the switch on and thus run down the batteries.

To start, the spark should be fully retarded—not only to eliminate the possibility of back-firing but because the spark is actually hotter when the spark control lever is fully retarded, with the engine running at very slow speed. At medium, or high speed the best results are secured with the ignition partly or fully advanced.

Data on 1912 Overland

Editor THE AUTOMOBILE:—Will you state, if possible, the amount of money earned as prizes by each of the following drivers during the 1915 racing season? Cooper; Anderson; Resta; O'Donnell; Rickenbacher; Alley; De Palma and Burman.

2—If possible will you print the horsepower curve of the 1912 Overland model 60?

3—What is the maximum number of revolutions of this motor per minute?

4—With this model stripped down, in good working order, geared 2½ to 1, what speed should it attain?

Somerville, Mass. C. R. N.

—The amount of money earned by the drivers you mention is as follows:

Resta	$37,750	Rickenbacher	24,000
Anderson	37,000	O'Donnell	19,000
Cooper	30,750	Alley	12,200
DePalma	24,600	Burman	11,000

2—THE AUTOMOBILE has no horsepower curve of the Overland 1912 model 60.

3—Maximum speed is from 1800 to 2000 r.p.m.

4—If this model were stripped down and in good working order geared 2½ to 1 you should be able to obtain a speed of from 60 to 65 m.p.h.

Recommends Use of Tire Caliper

Editor THE AUTOMOBILE:—In looking over THE AUTOMOBILE for March 9, I was much interested to read the article in The Rostrum by M. C. C. on prolonging the life of automobile tires. M. C. C.'s idea of changing the tires around on the different wheels seems to have worked out very well in his case, but he evidently is willing to go to more trouble than the most of us. In his letter, M. C. C. says, "While on this subject, why not give us a well worked-out table showing the actual inflation pressures for tires of different sizes and under different loads, giving actual road weights and not empty car weights which plainly mean nothing when taking a seven-passenger car and a runabout with the same size tires. There is no use carrying a greater inflation than is necessary and proper for the weight the tire has to support."

The writer has felt a good deal the same way about this, and a few months ago the problem was solved by the use of

a tire caliper designed to take actual load into consideration in maintaining air pressures. For instance, the tire caliper is placed over the tire at the top where there is no load strain. After this is done, the reading is taken on one of two scales shown on the caliper. The caliper is then set at the same reading on the second scale, or load scale, and the caliper placed over that part of the tire which comes into contact with the ground. If the tire does not fill out the space within the jaws of the caliper, there is too much air in the tire for the load. On the other hand, if the caliper will not slip over the tire, there is not enough air in the tire, and more should be put in.

To the writer, this seems to be the simplest and most satisfactory method that he has used, it being much less trouble than the air gage, which necessitates removing dust and valve caps. I believe that M. C. C. will be interested in this, as well as many other motorists who are anxious to cut down tire bills.

Boston, Mass. G. A. S.

Wire Cloth Strainer vs. Chamois

Editor THE AUTOMOBILE:—In two different issues of THE AUTOMOBILE I saw articles concerning a charge of static electricity being generated by passing gasoline through a chamois. In order to set myself right on the matter I wrote to the Department of the Interior, Bureau of Mines, Washington, D. C., for authentic information and for the benefit of your readers I am quoting from a letter received from this department.

"There are various reports which have come to the attention of this bureau which would make it appear that when gasoline is poured through a chamois skin in a metal funnel, the funnel is charged with static electricity. If the funnel is grounded, naturally the charge passes off to the earth. In cases where the funnel is held above the metal receiving tank or the container, and when a considerable quantity of gasoline is passed through the chamois skin, a comparatively large charge accumulates from the funnel, and if the funnel should come in contact with the container, the charge is drawn off, resulting in a spark which, from reports received, has ignited gasoline vapor.

"A charge of static electricity was obtained by placing a chamois-lined funnel inside of a glass funnel, insulating the metal funnel from the container, which was insulated from the ground by being placed upon a rubber-covered table. A copper wire connected the glass funnel with an electroscope. Upon pouring gasoline through the chamois-lined funnel a charge of static electricity was generated, as indicated by violent separation of the leaves of the gold-leaf electroscope. When the container and funnel were grounded, no charge of electricity was generated. In damp, warm weather there is less danger of generating the charge than when the humidity is low."

It is evident from the above that it is preferable to strain the gasoline through a wire cloth and at all times to have the funnel, container and receiving tank in contact and properly grounded.

Media, Pa. R. A. H.

Removing Scale from Radiator

Editor THE AUTOMOBILE:—Please give complete directions for removing scale and other deposits from the radiator of an automobile.

I have seen general directions, but they never seem to be complete. If sal soda or soda ash is used, please state how much per gallon and under what conditions to use same, how long it should be left in the radiator, etc.?

Uniontown, Pa. E. T. P.

—Scale can be removed from radiators by using a saturated solution of common washing soda and water. Thoroughly flush the radiator out with the solution then clean with fresh, pure water. A mixture of ordinary washing soda in which 4 oz. is used to the gallon of water will do the work properly.

Horsepower and Pulling Power

Editor THE AUTOMOBILE:—Suppose two automobiles each weigh 2600 lb., one having a horsepower of 25 and the other 26; about how much more weight would the 26 hp. one move at usual driving speed than the 25-hp. car? Would it be as much as 500 lb.?

Rochester, N. Y. W. A. P.

—Assuming that both cars had the same frictional losses in transmission of power and had the same gear reduction, the ratio of pulling power under most circumstances would be 25 to 26. It is impossible to give definite figures.

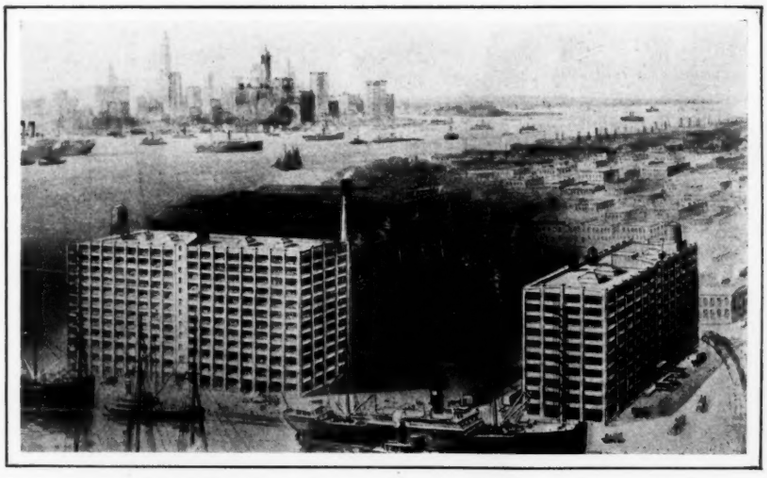
Correct Timing of Chandler

By a typographical error in giving the firing order of the Chandler six in The Rostrum last week, the fifth cylinder was mentioned twice. The correct firing order is 1-6-3-5-2-4.

Bijur Adds Twelve-Story Plant

NEW YORK CITY, April 8—The Bijur Motor Lighting Co., Hoboken, N. J., is erecting a fireproof twelve-story and basement addition to its plant, which will be 265 by 85 ft., giving 260,000 sq. ft. of floor space. The construction is steel, concrete and glass, and the building is located about 150 ft. from the company's present plant which will be continued. It is expected that the addition will be occupied by July. Offices will be on the top floor and a progressive system of manufacture will be used, the materials passing downward until emerging as complete machines on the ground floor. There are two passenger and two freight elevators and an automobile elevator.

It is probable that the spacious basement of the new building will be utilized for a garage which will be of the most up-to-date type. Shipping facilities of the Bijur company plant and its addition are excellent.



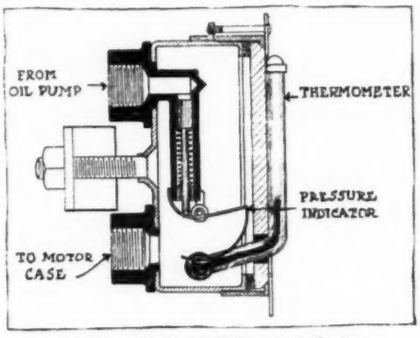
Architects' drawing of Bijur plant. Present quarters at right and addition at left

ACCESSORIES

Climax Motor Indicator

THIS device combines a pressure gage, motor indicator and oil sight feed and is mounted on the dash. The makers rely on the lubricating oil of the motor for registry, referring to it as "the blood of the motor," as it comes into contact with all the working parts. No matter how high the pressure may run when the motor is cold, the instrument is not affected by the additional strain imposed on it by such conditions, according to the manufacturers. The oil gage enables the driver of the car to see whether or not the oil is circulating properly and the indicator registers the temperature of the oil on the thermometer as it passes through the gage. The importance of this is that, should the quantity of the oil in the motor diminish, a rise in temperature would be indicated on the thermometer, as would also poor circulation of the cooling water, a late spark or too rich or too lean a mixture. When the thermometer registers "no higher" than the atmospheric temperature, the oil is not working. The indicator sells for $5.—Climax Motor Devices, Cleveland, Ohio.

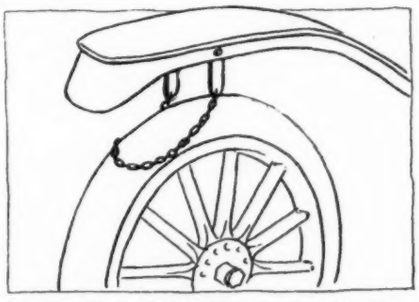
Climax motor indicator for dash mounting



Section through Climax indicator

Wild's Tire Guard

This guard consists of a chain resting on the tire, its purpose being to dislodge nails, sharp stones and similar objects before they can penetrate far enough to do serious damage. The chain attaches to fender brackets. Price, $1.25 each.—Motor Car Supply Co., Minneapolis, Minn.



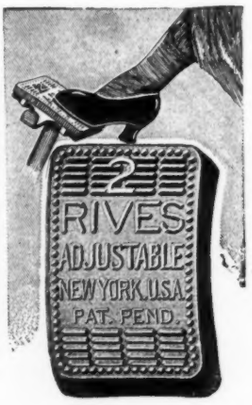
Wild's tire guard for removing nails, etc.

Goodyear Tire-Saver Kit

This kit is designed to enable car owners to increase the mileage obtained from their tires by applying first-aid measures before serious troubles develop. It contains a rim cut patch; an outside protection patch; a No. 4 self-cure patch; a 2-oz. can of repair tape; a 2-oz. can of patching cement; a 2-oz. can of tire putty; a pressure gage and a tube of French talc. For tires of 3 and 3½-in. diameter, the kit sells for $3.50; for 4 and 4½-in., $3.75, and for 5 and 5½-in., $4.—Goodyear Tire & Rubber Co., Akron, Ohio.

Rives Never-Slip Pedal Pads

These rubber pedal pads are designed to obviate all tension, shock and wearing of the shoe sole, also to prevent the foot from slipping in operating the pedals. No. 1 is made for Fords and will fit all oval pedals from 1¾ by 3¾ in. to 1⅞ by 3½ in. No. 2 fits all pedals having flat or curved surfaces measuring from 2¼ by 3¼ in. to 2¾ by 3¾ in. No. 3 is for pedals with large oval surfaces from 2¼ by 4 to 2¾ by 4½ in. No. 4 is for Maxwell cars. No. 5 for Mitchell and Dodge Bros., being for pedals with round surfaces from 2¼ to 2¾-in. diameter. No. 6 fits pedals with long and narrow rectangular or oval surfaces from 1½ by 3¼ to 1¾ by 4 in. No. 7 is for pedals with flat or curved surfaces from 2⅜ by 4¼ to 2¾ by 4¾. The pads sell for $1 per set for all models.—George H. Rives Mfg. Co., New York City.



Rives adjustable rubber pedal pads. These are made for all makes of cars

Kilborn-Sauer Lamps

Among the many lamps in this line is a distinctive little projector only 3½ in. diameter which sells for $3.50. It has a one-piece cylindrical body, a universal joint so that the light can be projected in any direction, a handle at the back and a substantial bracket for attachment to the windshield; a dash switch goes with each lamp. A larger spotlight is made in two models, 6-in. and 8-in.; the former costs $6 and, with 4-in. mirror, $7, and the latter $9 and $10. In this lamp also the body is in one piece, but it is of the more conventional parabolic form. A Ford set of 2 side lamps and a tail lamp is offered at $5; the feature of the side lamps is that they throw light on the running-boards without shining in the eyes of the driver. A sufficient length of flexible cable is furnished with each set.—Kilborn-Sauer Co., Fairfield, Conn.

Motor-Aid

A fan wheel with a heavy flywheel rim is installed in the exhaust line so that the gases impinge upon the blades of the fan and cause it to rotate rapidly. The strong exhaust impulses give the wheel a high rotative speed and this is maintained by the flywheel so that the fan acts as an exhauster between impulses, creating a partial vacuum in the exhaust pipe and assisting in clearing out the products of combustion. The makers claim better and more economical motor operation due to reduction of back pressure. Price, $30.—Motor Aid Co., Chicago, Ill.

Two of the Kilborn-Sauer spotlights

The Automobile

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Stock Versus Custom

EVERY man knows that the reason the average American automobile is such excellent value for its price is because it is a stock product. Because it is reproduced in quantities without any difference between one car and the next of a particular series. It can be but a fraction of the price that would be needed if each car were of different design.

We have to-day stock cars of enough sizes, qualities and types to suit all classes of buyers. The custom built chassis has ceased to exist and the custom built body is asked for only by those who wish individuality for its own sake, who must have something different from their neighbors and are ready to pay the large price demanded. The custom built car came first and is still selling in large numbers, larger than ever probably, but the stock car grew alongside and multiplied at an immense pace so that the custom built car has become an insignificant percentage of the total.

Standardization, of the sort which has been carried out by the S.A.E., has the same effect upon the industry as a whole as has concentration upon one type of chassis upon the business of a single manufacturer. Without standardization of detail the stock cars of to-day would be quite considerably more costly.

The individual manufacturers effected standardization within their own factories as soon as ever they commenced to concentrate upon real manufacturing as opposed to car building. The S.A.E. standards begin where the individual manufacturer leaves off and carry the process on, so that the steel mill and the parts maker are saved the necessity of "building" their product for each manufacturer of automobiles. Over the whole range, from the melting of the ores to the shipping of the completed car, every saving in cost that can be made reaches the final buyer.

Work Only Begun

The standardizing work has but begun; it will never be completed as long as knowledge progresses, for new discoveries will demand new consideration. For the next 10 years automobile standardization will go on increasing in importance, will need more work and more money for its successful accomplishment. It is just about to expand out of America and to spread over the earth as the American automobile is spreading and acting as the missionary.

The Differential

THE suggestion that the differential may cease to be a part of automobile makeup will come as a shock to a good many engineers who have always thought it an essential. On the short wheelbase cars of the early days it was essential and, giving little trouble, few have given it much thought. Always it has been realized that the differential had a bad fault in that the power goes to the wheel with the least traction, and if one wheel has no traction, as when in a mud hole, then that wheel spins and the car comes to a stop. There have been many attempts to overcome this. One of the earliest was to fit each rear wheel with an overrunning clutch. so that the outer wheel was driven when on a curve, the solid driveshaft turning idly within the inner wheel. This worked very well, but a car of this type could not be reversed without rather complicated locking mechanism for the clutches.

Many Alterations

Next attempts were made to devise an overrunning clutch which would act automatically both forward and reverse without hand control; then came differentials with high internal resistance, and finally solid axles without differentials. To-day all three of these types exist side by side and the engineers are becoming sufficiently interested to investigate them seriously. The outcome may easily be a distinct improvement in the conventional car by lessening the danger of skidding and increasing tire durability.

The ideal is to have a differential for some conditions and not to have one for others, while the wheel that has the least traction should receive the least power. Of the two wheels the one best able to transfer the tractive force to the road should get most of that force and the wheel with little traction not enough to make it spin.

328,366 Cars Built by Five Cities in Three Months

During January, February and March, Detroit, Toledo, Flint, Jackson and Lansing Broke All Records—238,076 of Total Built in Detroit Plants

DETROIT, MICH., April 8—Automobile production for January, February and March of this year has reached the total of 328,366 cars from the five cities of Detroit, Toledo, Flint, Jackson and Lansing, all in the great production zone surrounding this city. This increase for the first quarter has no precedent in automobile manufacturing annals. During the first three months of 1915 all of the automobile factories in the country built approximately 106,000 machines. The Detroit zone alone has tripled the production of the entire country during the first quarter of this year.

Detroit Plants Lead

Of this total of 328,366 machines built in these five cities, Detroit factories lead with 238,076 cars, according to a careful census made by THE AUTOMOBILE. This leaves 90,290 machines for the other four cities which house such large factories as Overland, Buick, Reo, Chevrolet, Oakland and Oldsmobile.

Figuring the average overall length of the 238,076 cars built in Detroit in the first three months of 1916 to be 12 ft., these cars would form a line 540 miles long if they were placed end-to-end. In other words, such a line would extend in a double line from Detroit to Chicago.

Naturally Ford leads in these almost staggering figures of production increase in this production zone. There were 149,005 Fords built during the three months. March was the greatest month in Ford history, there being 58,329 cars built at the home factory and the several assembly plants. Ford figures for the three months are: January 44,365; February 46,311; March 58,329. These figures almost eliminate any doubt as to the probability of 500,000 Ford cars being built during the fiscal year.

Overland Is Second

Following Ford comes Overland, the second largest producer of automobiles in the world. This Toledo factory has made extraordinary progress in production during the first three months of this year as compared with the corresponding months last year. January, February and March, 1916, resulted in the manufacture of 47,465 Overland cars, 12,393 in January; 15,292 in February and 19,780 in March. Compare this with the total for the first three months of 1915, which was 17,245 automobiles. In other words, March, 1916, exceeded the entire production of the first three months of 1915 by over 2000 cars and the entire quarter is nearly three times ahead of last year's first quarter.

Carload Shipments

January	12,000
February	21,502
March	28,600

Car Production

Ford

January	44,365
February	46,311
March	58,329

Overland

January	12,393
February	15,292
March	19,780

Many other factories have shown proportionate increases. Take the Saxon, for example. Last year's first quarter showed a combined production of 2591 Saxons, but for the present quarter 6391 machines carried the Saxon name. March just passed resulted in the building of 2604 Saxons, thus exceeding alone the record of the first three months of 1915.

Production's Rapid Increase

Everywhere you go you are met with information of unprecedented growth in production among the well-known companies.

Studebaker indicates an increase of 100 per cent over last year's first quarter. Packard declares that its production has stepped up 300 per cent.

Cadillac has shipped 26,563 eights since it started to make them, a wonderful showing for a high-priced car, as prices are reckoned these days. There are some 400 Cadillacs awaiting shipment now, and they would have been on the road long ago had there been freight cars in which to ship them.

Reo has been enjoying a wonderful growth in Lansing, and shows greatly increased output.

Oakland states that its production is 400 per cent better than for the first quarter of 1915.

March showed the best record for manufacture and shipment of cars in the history of the Paige-Detroit Motor Car Co., production facilities having been increased to 175 cars a day.

Maxwell is making over 300 cars a day now, and is attaining a monthly output of about 8000.

If it were possible to divulge the actual output in all of these cases, the public would be astounded at the figures. These give a good indication of the great advance which the industry is making in nearly all directions.

Many Handicaps

When you consider that a number of things of a more than passing seriousness have been confronting the makers this year, the results are all the more astonishing. Never has the tie-up of freight cars been so acute; never in the history of the business have raw materials been higher or more difficult to obtain; gasoline is high; prices in a great many instances have had to be raised on the cars as a result of materials conditions; labor of the right kind is scarce.

Yet with all their problems, the factories are striving in every way to meet the demand for cars. Higher prices do not seem to mitigate against the vehicles in any way, for the average purchaser seems willing to pay slightly more rather than have the quality of the car curtailed. All seem to realize the unusual market conditions and understand the reasons for increased prices.

Freight Situation Easier

Although the National Automobile Chamber of Commerce reports no betterment of the freight car situation, there are some who feel a bit easier over it, although nothing very beneficial has developed. The removal of certain embargoes to points in the East have helped somewhat, and with spring coming on, it seems likely that the congestion will automatically be bettered, at least slightly. March was the record shipping month so far in the history of the industry, the carload shipment statistics for 1916 being given herewith.

J. & D. Tire & Rubber Co. Formed

H. O. Smith Completes $500,000 Organization — Factory in Charlotte, N. C.

CHARLOTTE, N. C., April 7—The J. & D. Tire & Rubber Co. was organized here to-day for the manufacture of pneumatic tires for automobiles. The president of the organization is Harold O. Smith, who started in the rubber business in 1893 as one of the founders of the Indianapolis Rubber Co., which concern later became the G. & J. Tire Co. of Indianapolis, of which Mr. Smith was president. Mr. Smith was in the tire business approximately thirteen years until 1906, when he formed the Premier Motor Car Co. of Indianapolis, of which he was president until a year ago.

It has been known for more than a year that Mr. Smith has been arranging for the formation of the tire organization, which was completed to-day. Charlotte, N. C., was selected as a factory location because it is a favorable center for satisfactory labor for this class of work and offers good facilities for the necessary factory power.

The J. & D. Tire & Rubber Co. has been capitalized for $500,000 and will manufacture only one grade of pneumatic tire, which will be built in all the necessary tire sizes. It is expected that the trade name for these goods will be J. & D. Production will be started by July. This is possible, as Mr. Smith obtained options on tire machinery last October. Already plans have been drawn up for the erection of a new factory in this city and work has commenced. The factory contracts are such that production will be possible by July.

Mr. Smith has been elected president of the organization and has connected with him some most influential interests and men strongest financially in this section. To facilitate selling arrangements some of the largest distributing interests in the country have been taken into the organization, so that J. & D. tires will be sold largely to the company's own organization. Associated with President Smith are: Thomas J. Northway, Rochester, N. Y., vice-president; L. A. Falger, Charlotte, N. C., secretary; C. C. Coddington, Charlotte, N. C., treasurer. Directors, in addition to the officers, are: Harry S. Leyman, Cincinnati, Ohio, D. H. McColough and E. Thomonson.

—

22,773 Canadian Fords in 8 Months

FORD, ONT., April 7—From the beginning of the 1916 fiscal year of the Ford Motor Co. of Canada, Ltd.; that is from Aug. 1, 1915, to April 5, 1916, or a period of about eight months, the Canadian Ford company made and shipped 22,773 Fords, as compared with 7443 during the corresponding period of the 1915 fiscal year. The total production for the 1916 fiscal year is expected to be 40,000. During March 4500 cars were shipped, of which 1681 went to foreign countries. Of the total of 22,773 cars made, 12,442 were sold in the Dominion and 9569 went to foreign countries. March 29 the company had its biggest day of production, when 312 cars were made and shipped, of which 120 were for export.

—

Auburn and Lozier Raise Prices

NEW YORK CITY, April 8—The Auburn Automobile Co. has advanced the list price on its Model 6-38 from $1,050 to $1,085, effective April 1. Models 4-36 at $895 and 6-40A at $1,375 remain the same for the present.

A $100 increase will be made on the Lozier four, which will sell after April 15 for $1,695. For the time being there will be no raise in the price of the six selling at $2,775.

—

1,111,623 Champion Spark Plugs in March

TOLEDO, OHIO, April 10—All production and sales records of the Champion Spark Plug Co., Toledo, Ohio, were broken during the month of March, just past. In that month were produced 1,111,623 complete spark plugs and 167,420 assembled porcelains, while sales were 1,137,299 complete spark plugs and 94,277 porcelains.

However, the Champion Spark Plug Co. states that there will be a 100 per cent increase in production when the new six-story addition is finished.

—

4460 Overlands in One Week

TOLEDO, OHIO, April 10—During the week ending April 8, the Willys-Overland Co., established a new shipping record, a total of 4460 Overland cars being shipped. This is at the rate of 743 cars for each of the six working days and better than thirty cars per hour, on a twenty-four-hour schedule.

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George Heads Napoleon Co.

NAPOLEON, OHIO, April 6—The recently incorporated Napoleon Auto Mfg. Co., this city, has elected A. O. George as president, F. P. Diemer and G. M. Donnelly, vice-presidents; O. A. Diemer, secretary and treasurer, and C. E. Donnelly, general manager.

The company will assemble a four-cylinder 25 hp. chassis at the start, and later on will produce a finished car. The Morningstar plant in this city has been secured.

$5,000,000 Perlman Stock Issue

Half of $10,000,000 Capital Offered to Public at $120 —Is Over-Subscribed

NEW YORK CITY, April 10—Stock of the $10,000,000 Perlman Rim Corp., recently organized here to manufacture the Perlman demountable rim, is to be offered to the public. Subscriptions to the underwriting of the 50,000 shares, no par value, out of 100,000 shares of the Perlman corporation, are being received by J. S. Bache & Co. at $120 a share. Underwriters will have the privilege of withdrawing half of their stock, which must be withheld from sale for six months.

Only $5,000,000 of the $10,000,000 stock was offered for subscription, the remaining $5,000,000 being retained by Messrs. Kaufman, Durant and Perlman, who jointly own the entire amount. Subscriptions received were nearly double the amount of the issue so that it was necessary to reduce the allotments.

The directors of the Perlman Rim Corp. are L. G. Kaufman, president of the Chatham & Phenix National Bank; W. C. Durant, president of the Chevrolet Motor Co.; L. H. Perlman; L. B. Rosenberg, banker, and Christian Girl, president of the Perfection Spring Co. Mr. Perlman is president of the new company and Mr. Girl vice-president. The executive committee is composed of L. G. Kaufman, chairman; W. C. Durant and L. H. Perlman.

The Perlman Rim Corp. will have 100,000 shares of stock of no par value, and will have no bonds or debt. The company will start with $3,000,000 cash.

Within ninety days it is expected that the output of the company will be established at the rate of 1,000,000 sets of rims a year. Earning power is estimated on this basis at between $2,500,000 and $3,000,000 per annum.

The application of the Standard Welding Co. for a temporary suspension of the injunction secured by the Perlman interests has been withdrawn.

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Goldie Is Columbia Factory Manager

CLEVELAND, OHIO, April 6—R. J. Goldie has become factory manager of the Columbia Axle Co., this city. For the past two years he has been the works manager of the Metals Products Co. Previous to his connection with the Metal Products Co. he was with the Chalmers Motor Co. for five years.

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Knight Tire Plant Reopens

CANTON, OHIO, April 6—The Knight Tire & Rubber Company, this city, closed since last week on account of a shortage of rubber, has reopened.

Bock Bearing Co. Reorganized

New $1,650,000 Bock Taper Roller Bearing Co. Takes Over Plant

TOLEDO, OHIO, April 6—Retaining the old name, a new $1,650,000 corporation has taken over the plant of the Bock Bearing Co., on Phillips Avenue, this city. The following officers have been elected: President, W. E. Bock; vice-president, Eugene Rheinfrank; secretary and treasurer, C. H. Clement.

The officers, with M. H. Murch of Cleveland and J. E. Dunipace of Toledo, comprise the directorate.

The new company was incorporated about a week ago under the name of the Bock Taper Roller Bearing Company.

Of the stock issue of the new corporation, $1,200,000 will be common and $450,000 will be 7 per cent cumulative preferred. The capital of the old company was $212,500 common and $150,000 preferred.

As part consideration in the transfer of the old company to the new, holders of old stock will exchange share for share of new stock, and holders of old preferred will receive two shares of new common for one of preferred.

The plant of the Bock Bearing Company will be tripled in its capacity. Work will be started immediately. The present output of bearings is 1200 a day. With the new facilities as planned, the daily output will be 3000 bearings. The company at present employs 200 men.

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Briscoe Motor Corp. Leases Fuller Buggy Plant

JACKSON, MICH., April 7—The Briscoe Motor Corp. has leased the plant of the Fuller Buggy Co., and will probably use it as its final assembly plant. Business has been increasing right along for the past few months, and more manufacturing room has become a necessity. As it will take too much time to build additions it was found advisable to lease buildings where it will only require a few weeks to put them into operative condition.

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Clyde Truck Plant in L. I. City

NEW YORK CITY, April 6—The Clyde Motor Truck Co., which was incorporated last month in Delaware with a capital of $750,000, of which $250,000 is preferred and the balance common stock with a par value of $10, has acquired a plant in the automobile district of Long Island City, near Woodside. It is expected that deliveries on its 1-ton truck, selling at $1,000, will begin in July. The purpose of the company is to assemble this truck exclusively. It is equipped with a Buda engine.

M. C. Swartz, a real estate operator, is president of the company; W. F. Melhuish, formerly of the White Motor Co., is vice-president; J. F. Mason is secretary, and E. E. Vreeland, an advertising man, is treasurer. Among the directors are P. R. McLean, a director of Fraser & Best, Ltd., Australian exporters and importers; Walter Kenlon, son of Fire Chief Kenlon, and P. J. Holdsworth.

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White Motor Co. Elects Officers

CLEVELAND, OHIO, April 10—At the annual meeting of the White Motor Co., the capital stock of the White Co., which is owned by the White Motor Co., was reduced from $5,000,000 to $500,000. The White Co. will become the selling organization for White trucks and automobiles.

The following board of directors was elected at the annual stockholders' meeting of the White Motor Co., April 8: Windsor T. White, Walter C. White, A. R. Warner, E. W. Hulet, Otto Miller, M. B. Johnson and J. R. Nutt, of Cleveland; and J. H. Harding, A. M. Hall, 2d., Theodore Roosevelt, Jr., and E. R. Tinker, of New York.

At the first meeting of the directors, the following officers of the White Motor Co. will be elected: Windsor T. White, president; Walter C. White, first vice-president; E. W. Hulet, second vice-president; M. B. Johnson, chairman of the board; Otto Miller, treasurer; A. R. Warner, secretary and assistant treasurer.

The White Motor Co. is having quite a little trouble in securing cars for the shipment of trucks to New York for export. As a result a large number of trucks have accumulated in its yards. The traffic department believes that if the railroads would increase their own charge for holding cars over time from 45 cents to $1 per day, shippers would experience relief sooner than through the increased demurrage charge which the roads are now allowed to charge shippers.

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Covert Incorporates for $1,000,000

LOCKPORT, N. Y., April 7—The Covert Gear Co., this city, has been incorporated with a capital of $1,000,000, to manufacture trucks, tractors and other vehicles. The incorporators are W. W. Armstrong, P. A. Clum, B. V. Covert.

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Schwalbach Leaves Perlman Interests

NEW YORK CITY, April 10—Alexander Schwalbach, formerly with the J. S. Bretz Co., and more recently connected with the development of the Perlman Rim Corp., has severed his connection with the latter. Mr. Schwalbach has not as yet made any plans for the future.

G. M. C. Buys 35-Acre Tract

To Provide for Possible Concentration of Cadillac Co.'s Plants

DETROIT, MICH., April 11—*Special Telegram*—Thirty-five acres of land have been purchased by the General Motors Co. in the northeastern part of Detroit, and adjoining a 58-acre tract which was acquired three years ago by the company. This gives a frontage on the railroad of 4600 ft., with shipping facilities on the Grand Trunk, Detroit Belt Line and Michigan Central railroads.

President C. W. Nash stated to-day that the property had been acquired to safeguard the Cadillac Motor Car Co. in the event that the company should deem it advisable to concentrate its plant at one place. At the present time Cadillac plants are situated in several parts of the city and such a site as the General Motors Co. has provided would mean complete concentration at the one location. The body factory is now several miles from the main works, and the remarkable growth of the Cadillac company has meant many additions to the parent plant.

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Peerless Truck Re-elects Directors

NEW YORK CITY, April 11—All the present members of the Peerless Truck & Motor Corp. were re-elected at the annual meeting in Richmond, Va., April 4. The election of officers will take place April 14. The board of directors is composed of the following members: C. V. Rich, vice-president of the National City Bank and president of the National City Co.; E. R. Tinker, Jr., vice-president Chase National Bank; P. J. McIntosh, 26 Broadway, president of the General Gas Appliance Co., director of Montreal Public Service Corp., and other Canadian companies; B. G. Tremaine, F. S. Terry, identified with General Electric Lamp Works at Cleveland; P. D. Wagoner, president of the General Vehicle Co., Long Island City; L. H. Kittredge, president of the Peerless Motor Car Co., Cleveland; Harrison Williams, identified with Cleveland Electric Illuminating Co., as chairman of board; E. W. Hargen; T. W. French, vice-presidents of the Peerless Motor Car Co.; and Harvey Hooke.

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Haas Joins Monroe Co.

FLINT, MICH., April 10—L. D. Haas, sales manager of the Chevrolet Motor Co. of Michigan, has resigned to become sales manager of the Monroe Motor Co., this city. F. K. Lane will succeed Mr. Haas at the Chevrolet plant. He is at present manager of the Chevrolet branch at Dallas, Tex.

Premier Organization Completed

Officers, Directors and Department Heads Selected—$2,500,000 Capital

INDIANAPOLIS, IND., April 10—The organization of the Premier Motor Corp., this city, has been completed and that concern is now ready for business. The corporation starts with a capital stock of $2,500,000 and large production of quality cars is the intention.

The officers are as follows: J. C. Flowers, president; F. E. Smith and E. W. Steinhart, vice-presidents; C. F. Jensen, secretary; and H. L. Thompson, treasurer.

The directorate consists of George Woodruff, president of the Illinois Bankers' Assn. and president of the First National Bank, Joliet, Ill.; H. L. Thompson, secretary of the Gerlach-Barklow Co., Joliet, Ill.; T. R. Gerlach, vice-president of the Gerlach-Barklow Co., Joliet; C. F. Jensen, president of the Vanguard Mfg. Co., Detroit, Mich.; F. W. Woodruff, vice-president of the First National Bank and vice-president of the Woodruff Trust Co., Joliet, Ill.; J. C. Flowers, Joliet, Ill., and E. W. Steinhart, Indianapolis.

The department heads are P. D. Stubbs, director of sales; Homer McKee, director of advertising; P. W. Tracy, director of purchases and stores; E. G. Gunn, chief engineer; F. P. Nehrbas, factory production manager; C. S. Crawford, associate engineer, and J. L. Yarian, associate engineer.

The entire plant formerly occupied by the T. B. Laycock Co., with 300,000 sq. ft. of floorspace, has been rehabilitated.

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Linsden, Goodrich European Manager, Here on Visit

NEW YORK CITY, April 8—Arthur E. Linsden, European manager of the B. F. Goodrich Co., Akron, Ohio, arrived in America last week on a short business trip. Mr. Linsden has charge of the Goodrich Paris factory, which was opened some five years ago. He is an American and well known in many car circles.

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Studebaker Elects Officers

SOUTH BEND, IND., April 10—J. M. Studebaker, Sr., Col. George M. Studebaker and C. C. Hanch were re-elected to the directorate of the Studebaker Corp. at the annual meeting of the stockholders held in the office of the company in Jersey City, N. J. Later, in New York, the board of directors of the corporation held its annual meeting and elected officers for the ensuing year besides appointing the regular committees. J. M. Studebaker was re-elected honorary president; Frederick S. Fish, chairman of the board, and A. R. Erskine, president. The other officers chosen are: L. J. Ollier and J. G. Heaslet, vice-presidents; C. C. Hanch, treasurer; C. D. Fleming, W. P. Shillington and F. Studebaker Fish, assistant treasurers; A. G. Rumpf, secretary; John B. Marsh, assistant secretary; Frederick P. Delafield, counsel; George A. Fulmer, cashier; H. E. Dalton, general auditor. The executive committee is composed of Frederick S. Fish, Henry Goldman, A. R. Erskine, H. H. Lehman, Frederick P. Delafield and Col. George M. Studebaker; the finance committee of Frederick S. Fish, A. R. Erskine, Col. George M. Studebaker, James C. Heaslet and C. C. Hanch.

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April 21 Standardization Day

CLEVELAND, OHIO, April 12—Large attendance is expected for the meeting of the standards committee of the S. A. E., which takes place here next week. April 20 will be a get-together day, there being several division meetings scheduled and the general meeting will begin at 10 a. m. April 21. The Cleveland section is arranging a most worthy entertainment for the visitors in the form of a paper and discussion on some of the most vital problems of carburetion. This will follow the meeting on April 21. The Statler Hotel has been chosen as headquarters and the management have placed a suitable meeting room at the disposal of the committee, these arrangements having been made by J. G. Utz, Perfection Spring Co., Cleveland, chairman of the miscellaneous division of the standards committee.

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Smith and Vincent to Speak to Detroit S. A. E.

DETROIT, MICH., April 10—Two of the best known members of the automobile industry in this city will be the speakers at the next meeting of the Detroit Section of the Society of Automobile Engineers. Paul Smith, vice-president of the sales division of the Chalmers Motor Co., will talk on the subject of Interpreting the Public to the Engineer, while vice-president of engineering, J. G. Vincent, of the Packard Motor Car Co., has chosen as his subject Motors of the Air. The gathering, which is expected to draw a record-breaking attendance, will be held Monday, April 17, in the convention hall of the Hotel Ponchartrain.

The Detroit section's nominations for officers are: D. McCall White, chief engineer of the Cadillac Motor Car Co., to succeed George W. Dunham as chairman; O. E. Hunt, vice-chairman; W. C. Rands, treasurer; Bernard C. Koether, secretary; K. W. Zimmerschied, nominated as member of the national nominating committee.

S. A. E. Reservations Going Fast

Plans for Summer Cruise of Society Taking Definite Form—Papers Good

DETROIT, MICH., April 10—The 1916 meetings committee in charge of the summer cruise of the Society of Automobile Engineers has already made 147 reservations for members and guests for this outing. The S.S. Noronic has a total accommodation for 550 and, with over one-quarter of this taken up in a fortnight after the matter was first placed before the members, it seems certain that the capacity of the boat will be sold well before June 1.

For the convenience of members taking the cruise, arrangements have been made for the S.S. Noronic to stop at Sarnia, Ont., on the return trip Friday, June 16, so that those desiring to take railroads from this point can do so. Detroit hotels will be crowded the week of the cruise because of other conventions, and for the convenience of those members taking the trip the Northern Navigation Co. has agreed to let those members stay on the steamship Friday night who cannot secure accommodations. No meals will be served Friday night on the boat.

K. W. Zimmerschied, chairman of the standards committee during the past year and who is chairman of the papers committee, has already made extensive progress, and the subjects presented will be of a high engineering caliber. The subjects will cover the entire engineering field, including such pertinent subjects as design of agricultural tractors, design of aeroplane motors, problems connected with motor trucks in military transport. and possibilities of kerosene engines in motor vehicles. The question of carburetion, so pertinent to-day, will receive adequate attention. Practically one session will be given over to papers and discussions on high-speed motors. Motor fuels will be considered at another session. Howard Coffin, member of the Naval Consulting Board, will present a paper on preparedness. J. E. Hale of the Goodyear company will read a paper on straight side vs. clincher type tires. C. H. Eason of the Hyatt Roller Bearing Co. will read a paper on engines for foreign tractors. H. D. Church of the Packard company will have a paper on motor trucks, and E. A. Nelson on pressed steel construction in automobiles.

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N. G. E. A. Opens Exchange Dept.

LAKEMONT, N. Y., April 11—An interesting method for assisting in the securing of the most efficient distribution of stock has just been adopted by the Na-

tional Gas Engine Assn. Secretary Brate has just issued to members of the N. G. E. A. the following bulletin:

"At this time when it is very hard to obtain materials which go into the construction of internal combustion engines, together with slow deliveries and high prices, we are pleased to announce the opening of an Exchange Department.

"This is just what the words imply. Smith & Co. have an over-stock of crankshafts, etc., which Brown Bros., if they only knew about, could use to good advantage; while Brown Bros. have a dead stock of cold-rolled shafting which is the very thing Smith & Co. have been trying to get delivery on. Both clean up their dead stock; both get materials they are in great need of. A shut-down has been prevented. A customer has his order filled on time.

"Send to this office at once a list of your dead stock.

"Let us have your list of requirements.

"Just another form of N. G. E. A. cooperation.

"No charge, of course, to members for this service."

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Tractor Co. May Occupy Crawford Plant in Streator

STREATOR, ILL., April 7—Representatives of the Auto Tractor Co. of Chicago are negotiating with the Commercial Club of Streator for the occupancy of the abandoned Crawford car plant to be utilized in the manufacture of a new device to be attached to an automobile by which it is possible to utilize the car for field work upon a farm, such as plowing, disking, harrowing, sowing, harvesting, or other lines. It is claimed by the inventor that with the use of this device the road speed of the car is diminished, while the pulling power of the engine is proportionately increased. The outfit consists of a pair of tractor wheels which are attached to a steel frame. Shafts are provided for transmitting the power from the automobile wheels to the speed reduction gearing and traction wheels. A radiator of sufficient cooling capacity to offset the slower speed is furnished.

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Kelley Buys Bromfield & Field

NEW YORK CITY, April 11—Martin V. Kelley, president of the Toledo advertising company bearing his name, has purchased outright the advertising business of Bromfield & Field, this city.

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Detroit Tube Co. to Expand

DETROIT, MICH., April 10—The Detroit Seamless Steel Tube Co., which makes tubing for automobiles and tractors, now located at 841 Jefferson Avenue, has purchased twelve acres of ground at Fort and Waterman Streets, and will erect a new plant, where it is expected, at least 2000 men will be employed.

No Shortage in Crude Petroleum

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Trade Commission Reports 100,021,790 Gal. Held in February

WASHINGTON, D. C., April 10—The Federal Trade Commission to-day submitted to Congress a preliminary report on the gasoline situation. The commission finds there is no shortage in the supply of crude petroleum; in fact, the supply on hand in February, 1916, was 31,000,000 gal. in excess of that available in February, 1915. In the tables submitted with the report the commission shows that gasoline rose 4.88 cents a gallon in the Middle West refineries and 5.50 cents a gallon in eastern refineries. This is but a fraction of the rise to consumers. The report shows that while gasoline was increasing an average of a little over 5 cents a gallon at the refineries, crude oil was rising but 1.17 cents at western and 1.55 at eastern refineries.

Crude Supply Plentiful

The commission found that instead of there being a lesser supply of crude petroleum on hand now, there were 100,021,790 gal. held in February, 1916, as against 69,323,242 in February, 1915; that production of gasoline increased from 76,663,537 gal. in January, 1915, to 97,506,217 in December, 1915; that 15 per cent of the total production is exported.

The effect of decreased production in the Cushing field in gasoline terms is given in a footnote, which says the gasoline content of oil from the Cushing field fell from 96,000,000 gal. in April to 36,000,000 in December. The gasoline content of all the oil produced in the United States decreased during the year. The estimate of the year's total gasoline content for all the oil in the country was 1,892,500,000 gal.

S. O. Produced 60 Per Cent

Standard Oil companies, the tables show, produced about 60 per cent of the year's gasoline output. Their total was 681,750,000 gal. and that of the independents 400,000,000 in round numbers. Gasoline stock held by refineries decreased steadily from last May, when the total is put at 292,000,000 gal., to December, with a total of only 152,000,000. Stocks increased from the first of the year to May. Price ranges show that the price charged by the independents averages about 1 cent higher than Standard Oil prices. The Standard was selling gasoline f.o.b. its refineries at 7.82 cents a gallon Jan. 1, 1915, and the independents were charging 8.38 for the same grade. There was little change until August, when the Standard price went to 7.88 and the independent price dropped to 8.02. Four months later, in December, the Standard was charging 12.84 and the independents 13.07.

A digest of the preliminary report follows:

"The Federal Trade Commission has for some time been engaged in an investigation of the entire petroleum industry. The extraordinary advance in gasoline prices, however, together with numerous complaints of discrimination received, has made it evident that immediate investigation of the gasoline situation is most urgently needed.

"The following steps are now being taken in the active conduct of this investigation:

Gathering Statistics

"First, crude-oil production is being studied, and the most accurate information available concerning quantity of production, storage and prices is being gathered. In this connection, every important refinery in the United States has been asked to report the kind and quantity of oil used, the price paid, and the stocks of crude held at various times during the year 1915.

"Second, refiners making over 95 per cent of the total production of the country are reporting the following facts concerning their gasoline business for each month of the year 1915: Quantity purchased, quantity produced, quantity sold, and quantity in stock; prices received f.o.b. refinery and at tank-wagon stations. A force of accountants is now in the field collecting data concerning intercompany sales of gasoline. These data are being supplemented by a careful examination of the accounts of certain representative refiners to ascertain the exact cost of refining different kinds of crude to produce gasoline, kerosene, lubricating oil and fuel oil.

"The schedules sent to refiners include questions on freight rates and marketing costs, and the rates are being checked by comparison with the tariffs filed with the Interstate Commerce Commission. Finally, a force of field men has collected hundreds of cases of actual retail gasoline prices from all sections of the country. Tank-wagon tickets and invoices show the prices paid by the garages to refiners and jobbers, thus affording a check on statement by the latter.

Data on Oils

"In order to be able to judge whether, as alleged, relatively low prices of other refined products have made it necessary to increase gasoline prices out of normal proportion to the rise in crude, data concerning production and prices of kerosene, lubricants and fuel oil are being gathered.

"The capitalization, earnings, dividends, and the price of the stocks during

(*Continued on page* 700)

N. A. C. C. to Work for Preparedness

Government Has Authorized Creation of a Special Department of Wide Scope

NEW YORK CITY, April 12—The National Automobile Chamber of Commerce is going to assist the United States Government in military preparedness and has authorized Alfred Reeves, its general manager, to create a special department for this work. Mr. Reeves has already started to lay plans for the collection of information on motor trucks owned by private citizens throughout the country. The work will largely consist in compiling information on the numbers of different trucks in different cities throughout the country, so that in case of emergencies these trucks can be called upon for Government use and dispatched to any particular point without loss of time.

Formal Opening April 17

This new work of the N. A. C. C. will be formally opened at a luncheon at the War College, April 17, when Mr. Reeves and representatives of the different railroads and other transportation interests will discuss the matter with War College officials under General McComb. The plan is to co-operate with the Government in co-ordinating all of the transportation interests in the country. It is not enough that a plan for speedy mobilization of motor trucks in the different States be agreed upon, but it is essential that motor truck transportation be co-ordinated with railroad and perhaps steamboat service, so that the last word in efficiency would be possible in case of emergency.

The work of interesting the N. A. C. C. in this preparedness program has been carried on by Howard Coffin, who is a member of the naval consulting board and is devoting a great deal of time to this work. Mr. Coffin has discussed the question of motor truck military transportation with the War College, and as soon as the N. A. C. C. authorized the creation of a department for this work, the War College accepted the plan and issued invitations for the luncheon.

S. A. E. to Co-operate

It is expected that the Society of Automobile Engineers will co-operate in this work insofar as engineering questions are concerned. The S. A. E. Council went on record some months ago as being in favor of co-operating with the Government on questions of preparedness. Its work will naturally go hand in hand with that of the N. A. C. C.

Besides compiling information on the number of motor trucks in different cities as well as their capacity, it is expected that the N. A. C. C. preparedness plan will include a country-wide organization plan for the possible mobilizing of these vehicles into different divisions subdivisions, etc., so that should emergency arise the entire plan will have been perfected and nothing will remain but the putting into service of the vehicles.

The plan further contemplates arranging these trucks in convoy order according to makes, so that in an exigency it will be possible to form a convoy in any section of the country of thirty or forty trucks of the same make. This method of convoy formation has proved most effective in Europe.

It is further planned to arrange with factories for supplies of spare parts. The actual shipping of these parts will not be carried out, but unquestionably an inventory of spare parts carried in different parts of the country will be included.

The plan further embraces the organization of factory repair crews in the different truck factories. These crews could be organized and ready for transportation at short notice to any State in the Union. The plans include the possibility of organization within the crews to increase their effectiveness.

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Steel King Tractor Manufacturing Plans Well Under Way

SAGINAW, MICH., April 8—The new tractor company, which will make the Steel King tractor, is a reality. The fact that $145,000 of the proposed capital stock of $200,000, which was declared by officials to have been subscribed for, and the announcement that the former plant of the Argo Electric Vehicle Co. has been secured makes it sure that activities will start without much delay.

Herman F. Moeller, who has done much of the experimental work, stated that construction of the first tractor was started about four years ago, and that since then about 100 were built, of which half are being used by farmers now and the other half are in the hands of dealers. The tractor has been perfected in many ways, and is believed to be as near perfect as it can be made. It will be sold for $985. It was announced that a contract has been made with a manufacturer of motors in Joliet, Ill., for motors having a total value of more than $200,000.

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Saginaw Co. Yale Eight Maker?

SAGINAW, MICH., April 5—It is likely that the new concern which will make the Yale Eight will be known as the Saginaw Motor Car Co. The capital stock is to be $250,000. The price of the car is to be $1,285. L. J. Lampke is the designer of the car.

Reo Completes Plant Additions

New Truck Plant, Engineering Bldg. Addition, Warehouse and Clubhouse

LANSING, MICH., April 10—The factory additions of the Reo Motor Car Co., this city, started in October, 1915, are rapidly nearing completion. These when finished will add between 10 and 11 acres of floorspace and will include an addition to the engineering building, a new plant for the Reo Motor Truck Co., a receiving warehouse, and a clubhouse for the employees.

The largest building is the new truck plant which is 239 by 316 by 762 ft., totaling 176,294 sq. ft., or 4.05 acres. This building has been finished and is of the modern type of factory construction with ideal conditions for the workmen.

The clubhouse when finished will be a two-story building, 74 by 196 ft., totaling 45,672 sq. ft. This building is rapidly nearing completion and occupies the plot of ground once used as a testing track. In the new clubhouse there will be a large assembly room, where different kinds of entertainment may be had. There will be bowling alleys, billiard rooms, gymnasium with swimming pool. A serve-self restaurant for the workmen and separate dining rooms for the executives are other features.

Women Have Privileges

For the women who work in the offices there are rest rooms. Equal privileges are given the women in access to the libraries and reading rooms. On certain days the gymnasium and swimming pool and other sections are set aside for the women exclusively.

The three-story receiving warehouse is practically completed. The first floor of this building will be used as a part of the receiving and shipping department, the second floor to be equipped with equipment for enameling such parts as the hood, radiator cover, fenders, mud splasher, etc. From the third floor of the new warehouse to the third floor of the present paint shop there is a bridge of steel construction which crosses one street and two railroad tracks. This is for the convenience of handling the finished bodies as well as the completed car.

On March 1 there were on hand for immediate shipment at the Reo factories orders for more than 4200 automobiles and trucks, representing more orders on hand than have ever been at any one time since the inception of the company. Owing to this increased business, requiring practically a 24-hr. working schedule, the Reo Truck company will delay moving into the new plant for a time.

Chase Orders Over $300,000

March Business Booked by Syracuse Concern Largest in Its History

SYRACUSE, N. Y., April 8—At a meeting of the board of directors of the Chase Motor Truck Company of Syracuse, N. Y., held on April 7, a report was submitted by General Sales Manager H. T. Boulden, showing that up to April 1 the Chase company had on its books, and unfilled, orders amounting to $301,414.04, represented by business for domestic shipment. The Chase factory schedule outlined up to and including June 1 was practically contracted for by March 1, and as a result "stock chasers" from the Chase factory are on the jump to take care of the increased schedule production provided for. "Much credit for the rapid strides made by the Chase Motor Truck Co. in the past year is accredited to the aggressive selling methods instituted by our general sales manager," said E. A. Kingsbury, secretary and treasurer of the company.

The March business booked by the Chase company was the largest single month's business in the ten years' history of the company.

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Railroads Anxious to Apply $5 Demurrage to Car Shipments

DETROIT, MICH., April 10—The freight car shortage, though improved, is still far from what it should be. Though the automobile dealers have shown improvement in taking prompt delivery of car shipments, the railroads feel that there is still much to be done in the way of cooperation on their part. The situation has caused the railroads much trouble, who are desirous of applying a special demurrage rate of $5 per day on automobile shipments. However, assurances that steps would be taken to correct the difficulty within the trade, has for the time delayed any such action. The proposition for a special increased demurrage charge to force the unloading of cars is likely to be brought up again on account of the extensive delays.

It is difficult to get a correct idea of the number of automobile freight cars needed daily by the Detroit manufacturers. Some of the automobile makers have been so greatly hampered in securing cars and have had at times such an accumulation of finished cars, all ready to be shipped, that they do not care to let any facts come into print, believing that the general public might not understand the situation and be under the impression that the manufacturer had been short on materials or was handicapped in some other way. One railroad man said that if 1000 more freight cars were placed at the disposal of the local automobile manufacturers to-day, tomorrow or any day, now, that they are all in the midst of their heaviest production, that, within 30 min. after the announcement of 1000 available cars was made, not one would be left without a bidder.

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Market Prices Steady

NEW YORK CITY, April 11—Prices on automobile materials last week were steady. Copper has gone up ¼ cent a pound to 28¾, while rubber is a little lower. Demand for copper continues active, with a steady booking of orders from domestic consumers. Offerings were light in crude rubber. Consumers manifested little interest in the market.

Spring has brought a larger demand for gasoline. Garagemen in this city report that during the last few weeks a large number of automobiles have been withdrawn from storage, but say that the average time of withdrawal has been later than usual. The demand for gasoline has increased proportionately, but is not as large per car as in other years. If the purchase is made in a section of the city where rent is low and where other overhead expenses are not large, a gallon of gasoline may be bought as low as 27 cents, and in the suburban districts of Long Island this price prevails.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Ch'ge Week's
Aluminum	.59	.59	.59	.59	.59	.59	...
Antimony	.44½	.44½	.44½	.44½	.44½	.43½	— .01
Beams & Channels, 100 lb.	2.68	2.67	2.67	2.67	2.67	2.67	— .01
Bessemer Steel, ton	45.00	45.00	45.00	45.00	45.00	45.00	...
Copper, Elec., lb.	.28½	.28½	.28½	.28½	.28½	.28¾	+ .00¼
Copper, Lake, lb.	.28½	.28½	.28½	.28½	.28½	.28¾	+ .00¼
Cottonseed Oil, bbl.	10.40	10.35	10.40	10.35	10.38	10.35	— .05
Fish Oil, Menhaden, Brown	.53	.53	.53	.54	.54	.54	+ .01
Gasoline, Auto, bbl.	.24	.24	.24	.24	.24	.24	...
Lard Oil, prime	.95	.95	.96	.96	.96	.96	+ .01
Lead, 100 lb.	8.00	8.00	7.88	7.75	7.75	7.75	— .25
Linseed Oil	.77	.77	.77	.77	.77	.76	— .01
Open-Hearth Steel, ton	45.00	45.00	45.00	45.00	45.00	45.00	...
Petroleum, bbl., Kans., crude	1.55	1.55	1.55	1.55	1.55	1.55	...
Petroleum, bbl., Pa., crude	2.60	2.60	2.60	2.60	2.60	2.60	...
Rapeseed Oil, refined	1.05	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine, Up-River, Para	.74	.73	.73½	.74	.74	.74	...
Rubber, Ceylon, First Latex	.87	.84	.86	.87	.86	.85	— .02
Sulphuric Acid, 60 Baume	2.00	2.00	2.00	2.00	2.00	2.00	...
Tin, 100 lb.	50.25	53.00	52.00	52.00	52.00	54.00	+3.75
Tire Scrap	.06½	.06½	.06½	.06½	.06½	.06½	...

Insurance Men Organize

National Automobile Underwriters' Conference Formed —Combines Interests

NEW YORK CITY, April 10—In order to bring the automobile insurance companies into a general national organization and to obtain agreement of rate scales, etc., the National Automobile Underwriters' Conference has been organized. A constitution has been drawn up and submitted to the various non-conference organizations, or, in other words, to those organizations which at the present time are not affiliated with any of the small groups which have been formed throughout the country. The companies which have approved the draft of the constitution of the national organization are the following:

Aetna Accident & Liability, Automobile Ins. Co. of Hartford, German-American Ins. Co., German-Alliance Ins. Co., Rochester-German Underwriters, Globe & Rutgers Fire, London & Lancashire, Eastern Department; Orient Insurance Co., English American Underwriters, Safeguard Ins. Co., Massachusetts Fire & Marine, National Ben Franklin Company, National of Hartford, Colonial Fire Underwriters Agency, Newark Fire, Niagara Fire of New York, North British & Mercantile, Commonwealth Ins. Co., Mercantile Ins. Co., Pennsylvania Fire, Phoenix Ins. Co. of Hartford, Connecticut Fire, Equitable Fire & Marine, Prussian National, Springfield Fire & Marine, Westchester Fire.

Non-conference companies that have agreed to co-operate as set out in accompanying letter: Assurance Co. of America, Colonial Ins. Co., Merchants Fire Assur. Corp. of New York, New Jersey Fire, Standard Fire of Hartford.

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Insurance Co. Gets Wisconsin Charter

MADISON, WIS., April 10—The National Automobile Owners' Inter-Insurers' Assn., home office, Gladstone, Mich., has been granted a license by the insurance commissioner of Wisconsin to do business in this State. The company reports that it has insurance in force amounting to $1,724,000.

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Dividends Declared

U. S. Rubber Co.: quarterly of 2 per cent on first preferred and 1½ per cent on second preferred, payable April 29 to holders of record April 15.

Grant Motor Co., for fractional quarter from March 9 to April 15 at rate of 7 per cent per annum on preferred stock, payable May 1 to holders of record April 15.

Willys-Overland quarterly of 1½ per cent on common, payable May 1 to stock of record April 22.

Chalmers Motor quarterly of 2½ per cent on common.

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Gasoline Steady in East—Higher in West

NEW YORK CITY, April 10—The price of gasoline remains steady in the East, the Standard Oil, Texas, Gulf and Crew-

Levick companies all quoting 24 cents, tank-wagon, basis in New York and 23 cents in New Jersey, which has been the prevailing rate for the past several weeks.

In Portland, Ore., however, a price record has been smashed, the Standard Oil Co. advancing the price to 19½ cents. Naphtha and distillate also advanced 1 cent to 18½ cents and 10 cents respectively in barrel lots. In Los Angeles gasoline has been advanced 1 cent to 19 cents.

The general impression among dealers appears to be that no further advance will be made in the immediate future but that there will be a slight drop, which may, perhaps, be followed by a further increase. This is borne out by a quotation credited to General Manager E. D. Warren of the Pennsylvania Gasoline Co. to the effect that his company will not make contracts for future delivery. He said there is a serious shortage of gasoline, and believes prices will reach a much higher level before Aug. 1.

In Decatur, Ill., the price remains 19½ cents wholesale, but many of the dealers have raised the retail price from 21 to 22 cents, the margin of profit at the former figure being too small; some dealers, however, are retailing at 20 cents.

There is a rather strange situation in Detroit, with regard to the gasoline situation, for while the Standard Oil Co.'s gasoline is being sold at 19 cents a gallon, the independent oil companies charge 22 cents a gallon. Officials of the latter concerns say that they cannot sell at a lower figure unless it be at a loss, while at the price charged by the Standard company it is claimed that this concern is making a big profit.

Chevrolet Features Securities

Reaches 191 at a 21-Point Gain —General Motors Lower —Paige Higher

NEW YORK CITY, April 10—Automobile and accessory issues are slated for higher prices, according to reports in Wall Street quarters. Chevrolet is predicted to go very high, as is Maxwell Motors and Studebaker. Last week Chevrolet continued its record rise of the previous work, reaching 191 on Saturday and 199½ the previous day. This stock has risen more than 100 per cent since last October, when it was offered to the public at 85.

When W. C. Durant, head of the Chevrolet company, decided to acquire control of the General Motors Co. by increasing the amount of Chevrolet stock and offering the new shares in exchange for General Motors, few people took advantage of the opportunity. The original offer was five shares of the smaller company's stock for each share of General Motors. At that time these figures represented parity between the two issues. After a few weeks, to take into account the advance in the price of Chevrolet, the ratio was changed to four for one, and shortly afterward the offer was withdrawn. Those who accepted the original offer are now over $500 ahead, as Chevrolet has nearly reached the 200 mark, while General Motors has fallen to 450.

An application to take Chevrolet stock from the curb and list it on the Stock Exchange has been pending for some weeks.

The Springfield Body Corp. has listed its stock on the curb. There is $750,000 of 8 per cent preferred and $1,500,000 common. The preferred was put out at par, and was reported sold the first day at 103. The common, which was put out at 50, sold up to 55.

Goodrich, Paige-Detroit, Chalmers, Reo and Willys-Overland shares have been fairly active. The strength and activity in the shares of Goodrich have been based on the sales during the first quarter of this year, which are understood to have increased more than 50 per cent. Paige-Detroit stock went up 60 points to 750.

Gray & Davis has put on the market $250,000 in common stock, which is being offered to investors at $40 a share, par value $25.

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$100,000 Phelps Mfg. Co. Is Reorganization of F. & H.

COLUMBUS, OHIO, April 10—The Phelps Mfg. Co., this city, incorporated with a capital of $100,000 to manufacture wire wheels for automobiles, is a reorganization of the F. & H. Wire Wheel Co., formerly of Columbus, but later of Springfield, Ohio. The concern was founded by Lee Frayer, and was at first called the Frayer Demountable Wire Wheel Co. Later it was called the F. & H. Wire Wheel Co., and moved to the Bauer Bros.' plant at Springfield. The plant will be established in the former Barndt & Johnson Auto Co.'s plant on South High Street, Columbus. New officers will be elected within the coming week.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Ajax Rubber Co. (new)	..	..	69½	70	+ ¼
Aluminum Castings pfd	98	100	98	100	..
J. I. Case pfd	75	80	87½	90	+2½
Chalmers Motor Co. com	91	93	159	..	+4
Chalmers Motor Co. pfd	90	92½	98	101	..
Chevrolet Motor Co	..	..	191	192	+21
Electric Storage Battery Co	50	51	61½	62½	— ½
Firestone Tire & Rubber Co. com	450	455	765	..	..
Firestone Tire & Rubber Co. pfd	110	112	113	..	..
General Motors Co. com	145	148	450	470	—10
General Motors Co. pfd	103	104	115½	116½	+1½
B. F. Goodrich Co. com	52¾	53¼	77½	79	+1⅜
B. F. Goodrich Co. pfd	101	103	115¼	116¼	+ ¾
Goodyear Tire & Rubber Co. com	220	225	336	340	—1
Goodyear Tire & Rubber Co. pfd	104	106	115	117	..
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	13	14	17	19	—1
International Motor Co. pfd	32	35	30	37	—5
Kelly-Springfield Tire Co. com	135	140	73	74	—2½
Kelly-Springfield Tire Co. 1st pfd	84½	85	96	97	..
Kelly-Springfield Tire Co. 2d pfd	137	140	..	..	..
Maxwell Motor Co. com	47	48	72½	73	+ ¼
Maxwell Motor Co. 1st pfd	85	85	85¼	86	— ¾
Maxwell Motor Co. 2d pfd	39¾	40½	56¾	57¼	+1
Miller Rubber Co. com	170	176	235	240	..
Miller Rubber Co. pfd	101	103	112	116	..
New Departure Mfg. Co. com	138	140	180	182	+5
New Departure Mfg. Co. pfd	106	..	111	..	..
Packard Motor Car Co. com	80	92	165	173	+2
Packard Motor Car Co. pfd	93¾	97½	100	104	..
Paige-Detroit Motor Car	..	..	750	850	+60
Peerless Motor & Truck Corp	..	..	26	27	+ ½
Portage Rubber Co. com	34	36	70	72	..
Portage Rubber Co. pfd	85	95	106	107	..
Regal Motor Co. pfd	..	..	15	20	+5
*Reo Motor Truck Co	13	14	28	29½	+1½
*Reo Motor Car Co	32	34	35¾	36½	+1⅜
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	62½	65	86	87	..
Stewart-Warner Speed. Corp. pfd	102	104	109	..	..
Studebaker Corp. com	66¾	68	141	142	— ½
Studebaker Corp. pfd	101	102	112	113	+1
Swinehart Tire & Rubber Co	80	85	88	89	..
Texas Co.	138	140	195	197	..
U. S. Rubber Co. com	73	74	51½	52½	+ ⅞
U. S. Rubber Co. pfd	108	109	110	112	+ ½
Vacuum Oil Co.	208	212	240	243	+10
White Motor Co. (new)	..	..	50	51	+ ½
Willys-Overland Co. com	131½	132½	230	235	+6
Willys-Overland Co. pfd	101¾	103	104	105	+2

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Auto Body Co	..	..	31	32½	..
Chalmers Motor Co. com	83½	..	159	..	..
Chalmers Motor Co. pfd	90	..	97	100	..
Continental Motor Co. com	165	182	..	38½	— ½
Continental Motor Co. pfd	..	..	9½	10¼	..
Ford Motor Co. of Canada	550	..	..	405	—10
General Motors Co. com	124½	126	450	480	+10
General Motors Co. pfd	102½	104	114	117	— ¾
Maxwell Motor Co. com	42½	44½	71	74	+ ½
Maxwell Motor Co. 1st pfd	80½	83	84	87	+ ½
Maxwell Motor Co. 2d pfd	36	37½	55½	58	+2¼
Packard Motor Car Co. com	80	92	165	175	+2
Packard Motor Car Co. pfd	93¾	97½	..	104	..
Paige-Detroit Motor Car Co	..	..	820	..	+10
*Reo Motor Car Co	29¾	..	36⅛	37	+2⅛
*Reo Motor Truck Co	12¼	13⅛	28	28¾	+1¼
Studebaker Corp. com	59	60¼	140	143	+1
Studebaker Corp. pfd	95	100	111	..	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	..	..	40	..
Kelsey Wheel Co	195	..	320	365	..
*W. K. Prudden Co	19	20½	29	33	..
Regal Motor Car Co	10	20	16	..	+3

*Par value $10.

Treble Car Tax in England

Tax Doubled on 16 Hp. or Less—American Cars Severely Affected

LONDON, ENGLAND, April 6—A treble tax has been placed on all British automobiles, ranging from $21 to $630, according to horsepower. According to trade circles, this will not only kill pleasure riding, but will go a long way toward crippling the industry.

The new scale doubles the tax on automobiles of 16 hp. or less and trebles that on cars of more than 16 hp. The new tax will hit the American cheap automobiles more than British cars, as virtually all of American-made cars here come within the category of more than 16 hp. The tax will probably mean a big drop in the price of second-hand automobiles.

The taxes on automobiles in Great Britain last year were as follows: 6½ hp., $10.80; 12 hp., $15.75; 16 hp., $21; 26 hp., $31.50; 33 hp., $42; 40 hp., $52.50; 60 hp., $105, and exceeding 60 hp., $210.

Japan Builds More Cars

TOKIO, JAPAN, April 6—Increased manufacture of automobiles in this country is indicated by the import figures for 1915, which show a falling off as compared with those for 1914. The total from foreign sources in 1915 was twenty-six cars valued at $30,595, whereas in 1914 the imports were seventy-nine cars valued at $106,420. Most of the cars being manufactured here are low-priced, thus affecting the imports of higher-priced foreign cars.

The sources of the cars imported in 1915 were: Great Britain, four, valued at $8,721; United States, ten, valued at $15,798; other countries, twelve, valued at $6,076. For 1914 the figures were: Great Britain, seventeen cars, valued at $30,356; United States, thirty-three, at $28,787; and other countries, twenty-nine, at $47,277.

A firm owning a taxicab service in this city is now operating forty-two cars, averaging 700 passengers daily. All of the cars are of American make. Each car covers an average of 60 miles a day. This firm has also undertaken the extension of a motor-bus service in Chosen.

Pelton Steel Co. Incorporates

MILWAUKEE, WIS., April 10—The Pelton Steel Co. has been organized here, and incorporated with capital stock of $100,000. The company has taken over a crucible plant at Chicago Avenue and Elliott Place, on the main line of the Chicago, Milwaukee & St. Paul Railway. An electric furnace with 250 tons capacity will be put into operation about June 1, and at present there are nine crucible furnaces working. Orders have been received lately from automobile manufacturers at Detroit, Mich. E. T. Pelton, who was with the National Steel Foundries for twelve years, is general manager of the company.

Liberty and R. C. H. Unconnected

DETROIT, MICH., April 10—The fact that the new Liberty Motor Car Co. of Detroit, recently organized by Percy Owen, has taken over the plant formerly occupied by the R. C. H. Corp., has apparently given the impression that there is some connection between the two companies.

Liberty officials state that there is no relation whatever between the two companies. The Liberty company has simply taken over their factory buildings and offices and the previous occupant has moved to another location.

The Liberty Motor Car Company is an entirely new organization, headed by Percy Owen, who is president and general manager. Liberty officials also include such well-known men as James F. Bourquin, who is vice-president; H. M. Wirth, secretary and treasurer; and R. E. Cole, chief engineer. These men are all automobile men of wide experience and were officials in the Saxon, Chalmers or Paige companies. From their most recent connections the general impression is that the new Liberty will sell at a medium price.

While there is no denial from the Liberty factory of this rumor, it is also hinted that the car will be of an entirely new type, designed to appeal to those who use better class motor cars.

Gibson Co. Opens in Danville

DANVILLE, ILL., April 8—The Gibson Co., Indianapolis, Ind., opened its display rooms here to-day. Jack Ryan of Indianapolis is in charge.

Welton Fender Co. Reorganized

COLUMBUS, OHIO, April 7—At a meeting of the stockholders of the Welton Automobile Fender Co., Columbus, a complete reorganization was effected. The new corporation is known as the Auto Cushion Fender Co., and the capital stock is $20,000, of which $17,500 has been issued. Dr. John M. Thomas was made president and Dr. Fred Fletcher, secretary-treasurer. Plans were made for a vigorous selling campaign of the fender which is made under contract by the Columbus Auto Brass Co. Several new models of fenders will soon be placed on the market.

Army Pleased With Trucks

Transportation and Commissary Officers Find Them Better Than Mexican R. R.

FORT SAM HOUSTON, TEX., April 10—Gen. Frederick Funston and the officers in charge of the transportation and commissary departments of the army are well pleased with the service that has been performed by motor trucks and automobiles in the campaign against Villa. Many difficulties were encountered in bringing the service up to its present high standard of efficiency, but it is now announced that the motor truck trains are meeting promptly all the demands of the United States military force in Mexico and that they are transporting foodstuffs and supplies with fully as great dispatch as could be done by railroad. In view of the fact that the Mexico & Northwestern Railroad is in very bad physical condition and that it is impossible to make more than 10 or 12 m.p.h. over the line, the motor truck trains are able to do considerably better than this. The worst feature of the motor truck transportation proposition is the difficulty that is met with in keeping the roads in repair. According to reports received by General Funston, the main military highway leading south from Columbus, N. M., is now cut into deep ruts for a width of more than 200 yd.

United States Orders 108 Trucks for Army Use

NEW YORK CITY, April 10—Contracts for four more complete motor truck trains of twenty-seven cars each have been awarded by the War Department. The 108 trucks will cost approximately $2,300 each, thus making the value of the contracts about $248,000. Fifty-four are to be White, twenty-seven Jeffery and the other twenty-seven Packard. When these trucks have been delivered the Quartermaster's Department at Columbus will control more than 270 trucks for moving supplies. Last week the War Department bought fifteen more water wagons for immediate shipment to Mexico. Twenty-eight Packards going to Mexico were supplied with regulation army transport bodies, of tarpaulin-covered tox type, 11 ft. long, 5 ft. 6 in. wide and with hinged sideboards 24 in. high.

No Petroleum Shortage

Continued from page 696

the last year of the chief refiners have been ascertained and more extended information will be gathered soon to aid

in judging whether the high prices have been necessary to maintain the normal rate of profit.

"For the purpose of bringing out the facts concerning alleged inequalities in the advance of prices in different sections, all statistics have been compiled by particular towns. Refiners and jobbers of gasoline have reported the the location of their tank stations in every town having a population of 2500 or over, throughout the entire country, and the quantity of gasoline sold thereat. Prices and costs can be computed by towns, States and sections, and the different conditions in the fields covered by different companies are being minutely examined. The dates at which prices changed at each point are recorded.

Grade Must Be Uniform

"A point of importance is the care used to make all price comparisons on the basis of the same grade of gasoline, as the investigation reveals considerable local differences in the quality of this product and changes therein during recent months.

Causes of Advanced Prices

"In its investigation of causes, the Commission is considering both domestic and foreign conditions, and is weighing every factor to detect any artificial or manipulative element. A letter of inquiry has been sent to every manufacturer of automobiles, farm tractors, and other gasoline engines in the country, to ascertain as far as possible the increased output of their products and the effect of the advance in gasoline prices upon the demand for their products and upon the consumption of gasoline. The following points are being examined: Forces of demand and supply as affecting the price of crude oil, exports and imports, deterioration in quality of crude, increased cost of refining, improved methods, and speculative holding of crude and gasoline.

"The close connection between the investigation of the causes of high prices and of the alleged discrimination should be noted: If prices are found to have been raised to higher levels in some sections than in others, making due allowance for quality of product, freight and marketing conditions, it may be inferred that an element of artificial manipulation has entered into the advance.

"In response to Senate Resolution 457, Sixty-third Congress, Second Session, the Commission is conducting its general investigation of the petroleum industry in such a way as to ascertain, if possible, the exact relation between the several companies into which the Standard Oil holding company was resolved in 1911. It is expected that the gasoline investigation will throw light upon this question.

O'Donnell Wins at Corona

Duesenberg Pilot Covers Boulevard Course in Grand Prix at 86.5 M.P.H.

Corona Grand Prize Winners

Car	Driver	Time	M.P.H.
Duesenberg	O'Donnell	3:29:52	86.5
Mercer	Thomas	3:36:01	84.0
Mercer	Pullen	3:38:36.4	83.0
Omar	Tetzlaff	3:58:04	76.1
Cyclone	Durant	4:05:24	73.9
Gandy Special	Waterman	Flagged	

CORONA, CAL., April 8—*Special Telegram*—The accident, which cost the lives of Bob Burman and his mechanic, Eric Schrader, is responsible for the final curtain in racing at Corona. Immediately following to-day's race, officials announced that with the tragic ending of the event came the decision never to hold another race on the boulevard course. The effect of to-day's fatalities overshadows Eddie O'Donnell's victory in a Duesenberg at the rate of 86.5 m.p.h.

Twelve Cars Started

Twelve cars were at the starting line when the signal was given and it was believed that Pullen's record of 87.8 m.p.h. set last year would fall. In practice the drivers had shown wonderful speed, and during the tryouts Hughes made laps at 106 m.p.h. There were five cars in the race that had lapped the course at better than 102 m.p.h. in practice, but during the practice dashes the weather had been cool. The intense heat to-day had a great deal to do with seemingly slow time made by O'Donnell.

Burman's car was wrecked in the ninety-seventh lap when he was in second place and less than a lap behind O'Donnell. Waterman, Oldfield and Hughes went out in the forty-seventh lap, leaving but seven cars on the course which made the race particularly attractive to the drivers since the purse was split five ways. Earl Cooper had gone out in the fifteenth, and the Tahais had left the course with a broken connecting-rod in the twenty-ninth.

Cooper's trouble was due to his wreck three days ago while traveling at 101 m.p.h. A front wheel left the axle and Cooper escaped death by a miracle. Both he and the mechanic, Reeve Dupton, escaped without a scratch but the car was badly damaged. Cooper worked for 48 hr. with a score of mechanics and had the Stutz at the starting line, but the engine had been strained so that the crankshaft was out of alignment and engine trouble developed from that cause early in the race. Tetzlaff's Milac was out of the list at the last moment due to a connecting-rod being broken in the last practice. Injury to Omar Toft caused his withdrawal and Tetzlaff took over his car, coming in fourth.

The Apperson was eliminated before the start. Blowing a tire on the back stretch near the point where Burman was wrecked, Sterling Price lost control of the car and after careening down the course for 200 ft. crashed into a palm tree. The car burned when the gasoline tank exploded. Tony Janette's Hartmann Special, a post entry that went in the day before the race, also was a victim of the jinx before the start, a broken connecting-rod keeping it out of the race. The Marmon entry also was cancelled at the last moment, by reason of inability of the driver, Jack Welsh, to get tires.

Some tires did not stand two laps, and every driver used all the tires he had in his pits with the exception of O'Donnell who went through the entire race with just one stop. The crowd was not so large as at the last Corona meet, there being only 68,000 admissions. Bosch magnetos were used on all the cars starting in the race and Bosch plugs on seven.

Corona's Last Race

The whole town is mourning for Burman and the little mechanic who rode to death with him. Citizens of the Circle City say that the only reason for the race this year was the fact that there never had been an accident on the fast course and after to-day's tragedy there never will be another Circle City speed event.

It was an unavoidable accident of the speedway, but it will never be forgotten by the many friends of Burman who saw the race. The main cause of the accident was the blowing of a rear tire. Burman had signalled that he was to change on his next visit to the pits, but he never reached there. He led the contest at the start and for seven laps he was out in front. Then he dropped back to second

Positions of Cars in the Corona Grand Prize

Driver	Car	Position by Laps										M.P.H.	Average, M.P.H.
		10	20	30	40	50	60	70	80	90	100	109	
O'Donnell	Duesenberg	4	3	2	2	1	1	1	1	1	1	1	3:29:52	97.1
Thomas	Mercer	3	5	3	4	3	3	3	4	4	2	2	3:36:01	93.2
Pullen	Mercer	1	1	1	1	5	5	5	5	5	5	3	3:38:36⅘	92.3
Tetzlaff	Omar	5	4	4	3	2	2	2	3	3	3	4	3:58:04	91.4
Durant	Chevrolet Cyclone	10	9	9	9	7	7	7	7	6	5	5	4:05:25	87.5
Waterman	Gandy Special	7	6	5	6	6	6	6	6	7			Flagged	87.5
Burman	Peugeot	6	2	6	5	4	4	4	2	2	Wrecked		97th lap	87.5
Oldfield	Delage	9	7	7	7			Broken rocker arm					47th lap	85.9
Gandy	Gandy Special	11	10	10				Engine trouble					47th lap	87.0
Hughes	Sunbeam	8	8	8	8			Broken clutch					47th lap	...
Teel	Tahais	12	11					Broken connecting rod in					29th lap	...
Cooper	Stutz	2						Engine trouble					15th lap	...

and Pullen took the lead, holding it until the fortieth lap, when O'Donnell went into first place and never was headed.

Burman stopped at his pit on the eleventh lap with a slipping clutch. He could do nothing for it and drove the race on high gear alone. To start the car after coming into the pit he would jack up the rear end and after the wheels were turning with the Peugeot in high gear the car would be let down in a pool of oil and dash off on high.

Burman Second in 80th

With only high gear, the car was hard on tires. It seemed as if Burman was always at his pit and it was hard to believe that he was in second place when it was shown on the scoreboard in the eightieth lap. He had less than a lap to make up when O'Donnell was making his first stop on the next round. Burman was driving the greatest race of his career. He had been in the back and had come up into the money several times during the race, and it seemed that he had a sure thing in second place and an even break for first when the accident happened.

When the left rear tire blew, the car went for the inside curve. After sliding down the curve about 100 ft. it struck a culvert and that flattened out one side of the wheel and bent the frame. The car then lurched out on the course, swung back to the curve and with one wheel in the gutter and the other on the curve, it plowed through two telephone poles, tore up 100 ft. of grass on the edge of the course, hit the curb again, crashed into a car standing on the inside of the course, then spun around, rolled over and finally came to a stop, 167 yd. from where it first hit the curb.

When news reached the pits that Burman was dying and Schrader was dead, drivers and mechanics cried like children.

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Misdemeanor to Place Tacks on New York Roads

ALBANY, N. Y., April 11—It is a misdemeanor to place on roads anything likely to puncture automobile tires, according to a bill unanimously passed today by the Assembly.

The measure prohibits the placing on any road, highway or public place of glass, tacks, nails or other articles which might injure an animal or person or puncture a tire. It was introduced by Senator Slater of Westchester and already has passed the Senate.

Senator Hewitt introduced a resolution to-day providing for a joint legislative committee of two Senators and three Assemblymen to investigate the use of lights on automobiles, the various devices for eliminating the glare of headlights and the use of public highways by trucks and omnibuses.

Nine Entries for Indianapolis

Two Maxwells and Three Frontenacs Register for 300-Mile Grind

INDIANAPOLIS, IND., April 6—Two Maxwells and three Frontenacs have been entered in the 300-mile race at the local speedway on May 30. The Maxwells are entered under the name of the Prest-O-Lite racing team and the Frontenacs by the Frontenac Racing Car Co., formed last winter for the exclusive building of racing cars.

Eddie Rickenbacher and Peter Henderson will drive the Maxwell mounts, which have been reconstructed during the winter months at the Prest-O-Lite plant.

The three Chevrolet brothers—Louis, Arthur and Gaston—will drive the Frontenacs. The cars are being constructed in the plant of the Frontenac company. Louis Chevrolet, who heads the company, states that he has abandoned his plans of entering the New York race on May 13, and will devote all his time to getting the cars ready for the local race.

The entry of these five cars brings the total up to nine, three Duesenbergs having been entered during the early part of March. O'Donnell and D'Alene will drive two of the cars. Henderson was to have been the third driver.

The entry of Joseph Christiaens with a Sunbeam six has been received in a cable to the speedway management.

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Three Events at Tacoma May 30

TACOMA, WASH., April 10—There will be just three sanctioned events on Decoration Day at the Tacoma Speedway. The first event will be for cars of 250 cu. in. displacement and less, for a distance of 10 miles. Event No. 2 will be for a distance of approximately 200 miles for cars of 600 cu. in. displacement, and event No. 3 will be for a distance of approximately 30 miles, fifteen laps of the speedway, for the same cars as event No. 2. Cash and accessory prizes will be given the winners in all three events. List of officials for the meet will be announced later.

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Twin City Prepares Schedule

NEW YORK CITY, April 10—The contest board of the American Automobile Association has received a request from the Twin City Motor Speedway Co., Minneapolis, Minn., for sanction of six sprint races to be held on May 30. The main event of the day will be a 5-mile race for a purse of $2,000. Three shorter events will carry a purse of $300 each, and the other two, also sprint affairs, will be for trophies.

The main event of the season at the Twin City Speedway is scheduled for July 4, when the 300-mile International race will be held. In September another meet will take place on the track, according to present plans, although nothing has been decided in regard to the details except that sprint races will probably be the feature.

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Cedar Rapids Tractor Demonstration on Aug. 14-18

CEDAR RAPIDS, IOWA, April 7—The dates for the big tractor demonstration to be held here this summer are Aug. 14 to 18, inclusive. Options have now been taken on over 1000 acres of land along the Iowa City interurban. Plans are being made to make the tractor demonstration a big Iowa home-coming and to entertain at least 35,000 people. There will be from thirty to sixty carloads of tractors.

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Sheepshead Plans 24-Hr. Race

NEW YORK CITY, April 10—Preliminary arrangements have been completed for a twenty-four-hour automobile race to be held on the Sheepshead Bay Speedway, June 16 and 17, under the direction of the Trade Racing Assn.

The race will be open to stock cars only, and the cash prizes offered total $10,000. Besides the cash prizes, the Universal Film Trophy is offered, to be competed for in accordance with the terms of a deed of gift not yet disclosed.

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300-Mile Race for Fresno

FRESNO, CAL., April 8—A feature of this year's celebration of Raisin Day in this city and throughout the San Joaquin Valley on April 29 will be a 300-mile road race over a 14-mile course containing two straightaways of 6 miles each and a 1-mile connecting road at each end. The Raisin Classic Motor Cup Holding Co., which is planning the race, expects that it will be an international event for a $10,000 trophy. A sanction has been requested from the A. A. A. contest board.

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New Montana Town Needs Garage

LIVINGSTON, MONT., April 10—In southern Montana near the Arch entrance to Yellowstone National Park, on the Yellowstone Trail, the new town of Wonderland City has been started through the efforts of the Todd Photo & Film Co., which will establish moving picture studios there, and among the opportunities for those seeking business locations, according to representatives of the film company, is the chance to open a garage and gas station.

Hudson Covers Mile at 102.5 M. P. H.

Super Six Stock Chassis Electrically Timed in New Record

DAYTONA, FLA., April 10—A Hudson Super-Six stock chassis, electrically timed, to-day established a new record by negotiating 1 mile in 35 11/100 sec. on the Ormond-Daytona beach. This is at the rate of 102½ m.p.h. Five other trials were under 36 sec. The car is rated at 29.4 hp., and develops 77 hp. at about 2500 r.p.m.

This new record compares with Burman's mark of 25.40 sec. in the 200 hp. Benz at Daytona, April 23, 1911, at the rate of 141 m.p.h.; Marriott's mark of 28 1/5 sec. in a 30 hp. Stanley steamer at Ormond, Jan. 22, 1907, at the rate of 127.66 m.p.h.; and 40.32 sec. made by Wilcox in a 301-450 cu. in. National at Jacksonville, Fla., March 30, 1911, or 89.4 m.p.h.

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Winton Opens Annual Chauffeurs' Contest

CLEVELAND, OHIO, April 10—Entry blanks for the ninth annual repair expense contest for Winton six chauffeurs will be distributed by the Winton company within a few days. In all $3,500 in cash prizes will be distributed to employed drivers of these cars between May 1 and Oct. 31, the capital prize being $500. These prizes are offered for the purpose of showing that the cars can be driven great mileage at a comparatively small expense. An average of eight years' records, secured in this way, show approximately 2,000,000 miles at an average repair expense of 19¼ cents per 1000 miles.

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Maxwell Salesmen in Conference at Factory Are Optimistic

DETROIT, MICH., April 6—District salesmen of the Maxwell Motor Co., from many parts of the country were in conference at the Maxwell headquarters this week, to discuss the plans for the spring and summer sales campaign. The visitors say that there is more money to buy automobiles than almost anything else.

Among the district salesmen present are the following: J. P. Headley, Atlanta, Ga.; W. A. Fries, Oklahoma City, Okla.; A. E. Morrison, Buffalo; L. G. Peed, Philadelphia; C. B. McLaughlin, Kansas City; C. H. Batchelor, Atlanta, Ga.; A. C. Reed, Providence, R. I.; L. F. Smith, Boston; P. R. Young and W. H. Schroeder, Omaha, Neb.; M. J. Williams, Kansas City, Mo.; C. S. Riedel, Detroit; G. E. Swope, Wichita, Kans.; J. J. Grant, Jr., Salina, Kans.; V. L. Malmfeld, Kansas City, Mo.; A. W. Johnson, Jr., S. E. Eggleston and H. E. Smith, Dayton, Ohio; C. D. Fintzel, Billings, Mont.; W. H. Lolley, Louisville, Ky.; L. A. Smith, Dallas, Tex.; W. H. Keller, Pittsburgh; E. F. McConaha, St. Louis, Mo.; W. H. Turner, Kansas City, Mo.; C. E. Beloate, Atlanta, Ga.

In addition to many business conferences, the visitors were taken to the enlarged Oakland Avenue Maxwell plant, to get first-hand knowledge on the Maxwell assembly system.

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Receiver for P. R. Mfg. Co.

DETROIT, MICH., April 7—The Security Trust Co. has been appointed permanent receiver for the P. R. Mfg. Co., of this city which, among many products, is making the Breeze carbureter and other parts for automobiles. The cause for the receivership is not a case of insolvency, but of stockholders being unable to agree among themselves. The Security Trust Co. was appointed a temporary receiver several months ago, and attempts were made by it to get the stockholders to work smoothly together, but the dissensions persisted and made the present move necessary. The trust company says that the P. R. company has assets of approximately $200,000, that its business has been good, and that there are plenty of orders on hand. The receiver will attempt to sell the company as a going concern.

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Electric-Vehicle Day in Chicago

CHICAGO, ILL., April 10—A day has been set aside for discussion of electric vehicles at the forthcoming convention of the National Electric Light Association, which will take place in Chicago, May 22 to 26. The session will be held at the La Salle Hotel. Among those who will read papers are W. P. Kennedy, New York, consulting transportation engineer; P. D. Wagoner, president General Vehicle Co.; E. P. Chalfant, eastern representative, Anderson Electric Car Co.; S. V. Norton, manager truck tire sales department, B. F. Goodrich Co.; F. E. Whitney, general manager, Commercial Truck Co. of America; C. W. Squires, Jr., sales manager, General Vehicle Co.

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Larger Show Building for Moline

MOLINE, ILL., April 7—Moline is planning to erect a coliseum which will furnish the largest public hall in the tri-cities, and which will be the home of the 1917 Tri-City Automobile Show. This action is taken owing to the fact that the Davenport Coliseum is inadequate, as regard to floor space, for the present annual motor exhibit.

May Close Garages on Sunday

Bay State Legislature Kills Bill to Repeal Present Statutes

BOSTON, MASS., April 11—*Special Telegram*—The bill which was introduced early this year in the Massachusetts Legislature and which would have permitted garages to be open on Sunday and to sell gasoline, oil, supplies, etc., has been killed in the State Senate.

This means, virtually, that under existing statutes, it is illegal for a garage to remain open on Sunday or to sell gasoline, oil or supplies. Local authorities, if they so desire, can force garages to close on Sunday, except to permit cars to go in and out.

The measure which would have eliminated this trouble passed the lower house in February and it was expected it would pass the Senate without trouble and be signed by the Governor. That it was killed has been a surprise to dealers and garagemen.

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$5 Minimum Fee in Md.

BALTIMORE, MD., April 10—On July 1, 1916, automobiles in this State will be taxed 50 cents per horsepower. Five dollars per year will be the minimum charge for any car. Commercial vehicles will be taxed upon a rated carrying capacity; $8 for a 1-tonner and $6 more for each additional ton.

Under the new law, speed limits in the hamlets will be the same. This city will be allowed to charge a reasonable fee for the parking of automobiles in spaces set aside exclusively for parking purposes in congested sections, but will not be permitted to make a special charge for the privilege of having one's automobile stand on the streets generally.

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Dealers Oppose Owners' License

NEW YORK CITY, April 11—The Automobile Dealers' Assn. of New York City is opposing the Simpson-Kelly bill in the Legislature; the bill would require that every operator of a car, whether chauffeur or owner, be licensed to drive. The bill as originally drawn included the State, but was amended to cover New York City only.

President R. H. Johnston of the association states that the opposition is on the general grounds of over-regulation; he states in a letter to Mayor Mitchell that there is so much regulation now and unintelligent enforcement of rules, that the car dealer and owner are harassed and made uncertain as to their personal and business conduct.

Factory Miscellany

Packett to Build—The Packett Motor Car Mfg. Co., St. Paul, Minn., will build a plant.

Agontz to Build—The Agontz Motor Car Co., Sandusky, Ohio, recently organized, will build a plant.

Hamilton Carbureter to Add—The Hamilton Carbureter Co., East Toronto, Ont., is erecting a large addition to its factory.

Marion Tire to Build — The Marion Tire & Rubber Co. is planning to build a plant at Marion, Ohio. The estimated cost is $20,000.

Thomas Co. to Add—The Thomas Mfg. Co. will construct an addition to its plant at Dayton, Ohio, for the manufacture of accessories.

To Make Truck Bodies—A. D. Moore and Mr. Shaw, Palmer, Mass., have leased the vacant belt factory in Belchertown, Mass., and will make automobile truck bodies.

To Make Piston Rings—The McCadden Machine Works, St. Cloud, Minn., have been formed to manufacture piston rings, machinery and machine parts. The capital is $50,000.

To Make Parts in Chattanooga — E. Van Winkle of Chattanooga, Tenn., is planning to establish a plant at Chattanooga, for the manufacture of parts and assembling motor trucks.

Gerlinger Truck to Build—The Gerlinger Motor Co., Portland, Ore., capitalized at $100,000, will construct a factory in Tacoma, Wash., to manufacture the Ger-Six motor truck.

Spartan Radiator to Build—The Spartan Radiator Co., Jackson, Mich., manufacturer of automobile radiators, has hac plans prepared for a new plant. It will be two stories, of brick and steel, 70 by 336 ft.

Gresham Co. to Add — The Beaver State Auto Co., Gresham, Ore., will build a brick foundry and will add the manufacture of malleable castings to its products. The building is to be completed by June 1.

Goodyear to Build—The Goodyear Tire & Rubber Co., Akron, Ohio, has taken out a building permit for the erection of a five-story, 68 by 142-ft. addition to its general office. The structure will cost about $48,000.

Carbureter Plant for Basic City—Carbureters will be manufactured by the Jordan Carbureter Co., Basic City, Va., which has been incorporated with a capital of $300,000. L. F. Jordan, of Basic City, B. E. Watson, Waysboro, Va., and others are the incorporators of the new company.

To Build Battle Creek Tractor — The Battle Creek Tractor is to be the name of a new product to be made by a company in which H. C. King of the H. C. King Seed Co., Battle Creek, Mich., and Myron Nash, Vicksburg, are to be the principal stockholders. The company is to have a capital stock of $50,000. The tractor is to sell at $900 with the plows, and at 775 without plows.

Fleetwood Metal Body in New Bldg.—The Fleetwood Metal Body Co., Fleetwood, Pa., is preparing to occupy its new building along the P. & R. Railroad. The building is an addition to the present three-story plant and contains 80,000 sq. ft. of floor space. Its dimensions are 40 by 350 ft., with connecting wings 40 by 80 ft. and 110 by 50 ft. It is equipped with modern machinery and methods for the manufacture of automobile bodies.

The Automobile Calendar

April 10-15.....Seattle, Wash., Show, Arena.
April 10-15.....Danville, Ill., Eastern Ill. Automobile and Electric Show; Chambers Bldg.
April 11-13.....Milwaukee, Wis., Spring Show; Dealers' Show Room Automobile Display; Milwaukee Automobile Dealers.
April 12-15.....Champaign, Ill., Show, Gymnasium Bldg., University, Ill.
April 14-16.....Milwaukee, Wis., Garage-Circuit Exposition, Milwaukee Automobile Dealers.
April 15.....Altoona, Pa., Pennsylvania State Motor Federation.
April 26-May 6...Oakland, Cal., First Annual Pacific Coast Motor Power and Automobile Show, Automobile Industries Assn.
May 6.....Sioux City, Iowa, Speedway Race, Sioux City Speedway Assn.
May 9-12.....Hot Springs, Va., N. A. A. A. J. Meeting, The Homestead.
May 13.....New York City, Sheepshead Bay Speedway Race. Metropolitan Trophy, 150 miles; Queens Cup, 50 miles; Coney Island Cup, 20 miles, and Brooklyn handicap for non-winners, 10 miles.
May 14-20.....Milwaukee, Wis., Sheridan Road Week to Complete Highway Connecting Milwaukee and Chicago.
May 20.....Chicago Non-Professional Speedway Race, Western Interclub Speedway Park.
May 26-27.....Del Monte, Cal., Meeting, Three Divisions of National Assn. of Automobile Accessory Jobbers.
May 30.....Des Moines, Iowa, Iowa Derby, 20 Miles; Des Moines Special, 10 miles.
May 30.....Tacoma, Wash., 100-Mile Speedway Race, Tacoma Speedway Assn.
May 30.....Indianapolis Speedway 300-Mile Race.
May 30.....Minneapolis, Minn., Speedway Race.
June 8.....New York City, Orphans' Day Outing at Donnelly's Grove, College Point, L. I. Orphan's Automobile Day Outing Assn.
June 10.....Chicago Speedway Race. International 300-Mile Race, Speedway Park, Speedway Park Assn.
June 12-16.....S. A. E. Summer Trip on Great Lakes.
June 16-17.....Sheepshead Bay Speedway, 24-Hr. Race, Trade Racing Assn., New York City.
June 20.....Galesburg, Ill., Track Race, 100 miles.
June 28.....Des Moines, Iowa, Speedway Free-for-all, 300-mile race.
July 2-6.....Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.
July 4.....Coeur d'Alene, Idaho, Race Meet, Hiller-Riegel Co.
July 4.....Tacoma, Wash., Speedway Race, Tacoma Speedway Assn.
July 4.....Minneapolis 300-Mile Speedway Race.
July 4.....Sioux City Speedway Race.
July 15.....Omaha, Neb., Speedway Race.
July 15.....North Yakima, Wash., Track Race, Riegel-Hiller Co.
July 17-21.....Dallas, Tex., Tractor Demonstration.
July 24-28.....Hutchinson, Kan., Tractor Demonstration.
July 31-Aug. 4....St. Louis, Mo., Tractor Demonstration.
Aug. 5.....Tacoma Speedway Race, Tacoma Speedway Assn.
Aug. 7-11.....Fremont, Neb., Tractor Demonstration.
Aug. 11-12.....Pikes Peak, Col., Hill Climb, Pikes Peak Auto Highway Co.
Aug. 12.....Portland, Ore., Track Race, Riegel-Hiller Co.
Aug. 14-18.....Cedar Rapids, Ia., Tractor Demonstration.
Aug. 18-19.....Elgin Road Race.
Aug. 21-25.....Bloomington, Ill., Tractor Demonstration.
Aug. 28-Sept. 1...Indiana Tractor Demonstration.
Sept. 4.....Des Moines Speedway Invitation Race. Limited to six entries.
Sept. 4.....Indianapolis Speedway Race.
Sept. 4-5.....Spokane, Wash., Track Race, Inland Auto Assn.
Sept. 4-8.....Madison, Wis., Tractor Demonstration.
Sept. 11-16.....Milwaukee, Wis., Fall Show, Wisconsin State Fair, Milwaukee Automobile Dealers.
Sept. 16.....Providence Speedway Race.
Sept. 29.....Trenton, N. J., Inter-State Fair. H. P. Murphy, Racing Sec.
Sept. 30.....New York City, Sheepshead Bay Speedway Race.
Oct. 7.....Philadelphia Speedway Race.
Oct. 7.....Omaha Speedway Race.
Oct. 14.....Chicago Speedway Race.
Oct. 19.....Indianapolis, Ind., Race, Indianapolis Motor Speedway.
Nov.....Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

The Week in the Industry

La Crosse Chalmers Builds — The Chalmers Motor Co. will build a four-story factory, 60 by 400 ft in size with a 40 by 60-ft. wing. The estimated cost is $150,000.

Renshaw Succeeds Tilley—J. B. Renshaw has succeeded L. A. Tilley as automobile sales manager of the South Bend branch of the Studebaker corporation. Mr. Renshaw has been connected with the Studebaker corporation for some time, having been in the accounting department.

New Westinghouse Distributors — Westinghouse starting, lighting and ignition systems for Ford cars are now handled by the Central Rubber & Supply Co., Indianapolis, Ind. Other distributors are as follows: The Owen Schoenck Co., Chicago; Alex. Seewald Co., Atlanta, Ga.; Hirzig Co., Nashville, Tenn., and the Rose-Lyons Hardware Co., Little Rock, Ark.

New Detroit Battery Stations — The Detroit Battery Co., Detroit, has recently established the following service stations: Hydrox Storage Battery & Mfg. Co., Cincinnati, Ohio; Allen T. Hurst, Paris, Ill.; E. N. Egge Auto Co., Plainview, Tex.; Harry Lipman, 30 Sheridan Avenue, Albany, N. Y.; Vedder Bros., Johnstown, N. Y.; Power Accumulator Co., Dawson, Minn.; Rhymer's Garage, Hartford, Conn.; James C. Nichols, 1673 Broadway, New York; C. L. Thayer, 174 South Wall Street, Columbus, Ohio; Master Sales Co., Omaha, Neb.; Berg Auto Supply Co., Oakland, Cal.; P. Buford, 208 West Seventh Street, Austin, Tex.; H. & M. Garage, West Frankfort, Ill.; H. H. Karsten & Brother, Zeeland, Mich.

Splitdorf Branch in Oakland—The Splitdorf Electrical Co. has opened a branch and service station at 3040 Broadway, Oakland, Cal.

Washington Items—Beaumont & Williams, the Northwest distributors for Gramm-Bernstein motor trucks, have established headquarters in Seattle at Melrose Avenue and Pine Street.

The Seven-Seven Co., Spokane, Dodge distributor, has taken the agency for Hartford tires, the Trailmobile and Vedol oil for Spokane and the Inland Empire.

Another new line of automobiles has been added to the Spokane district. The Nelson Motor Co. was formed and appointed eastern Washington distributor of Lexington cars. E. O. Nelson is manager of the new firm.

Trade Happenings

Zertner Heads Philadelphia Oakland—Z. S. Zertner, for several years well known in the farm implement manufacturing circles, has taken charge of the Philadelphia branch of the Oakland Motor Co. recently. Mr. Zertner succeeds T. S. Johnson, who for several years has been branch manager, and who resigned to take up other work.

Kayser Heads Providence Chevrolet—A direct factory branch has been opened by the Chevrolet Motor Co. in Providence, R. I., in charge of R. B. Kayser, formerly assistant manager of the Chevrolet Motor Co. of N. E. in Boston.

Ross Fiat General Manager—R. R. Ross has been made vice-president and general manager of the Fiat Automobile Co., New York City.

Valerius Master Carbureter District Mgr.—G. P. Valerius has been appointed district manager by the Master Carbureter Corp., Detroit, Mich. He will cover Utah, California, Wyoming and Montana. He was formerly a district manager for the Maxwell company.

T. L. Grabe, who was formerly agent for the Autocar Co. in Philadelphia, and later on the Pacific Coast, has been appointed factory representative for the Master corporation for the States of Michigan, Ohio and Indiana.

Vesta's N. E. Change—The New England interests of the Vesta Accumulator Co., Chicago, Ill., are being taken care of and represented by the Boice Motor Equipment Co., 76 Brookline Avenue, Boston, Mass., instead of the Boice Perrine Co., that city, as heretofore.

Burd Ring Items—A. C. Preston, until just recently with the Gahran-Pinchbeck Co., Albany, N. Y., Buick distributer, has accepted a position with the Burd High Compression Ring Co., Rockford, Ill., and will represent that company in the Albany territory.

This company has opened sales offices at 899 Boylston Street, Boston, Mass., with E. B. Allen as manager.

The Milwaukee offices of the Burd company have been moved from 403 Jefferson Building to the ground floor location at 813 Grand Avenue, Rockford, Ill.

Robert Allan has resigned as sales manager of the San Francisco branch of the company. He will be succeeded by H. B. Rathbone.

The Seattle, Wash., office has been moved from 538 Central Building to 705 East Pike Street. A. C. Hansen is the manager in charge of the Seattle territory.

Eight Overland Stations in Cleveland—The Willys-Overland Co., 6604-18 Euclid Avenue, Cleveland distributors of Overland and Willys-Knight cars, will in a short time have eight service stations so located that no Cleveland owner of an Overland will live further than a mile and a half from a station. This announcement was made by M. L. Bridgeman, general manager of the local branch. Expenditure of $500,000 in completing the service chain is contemplated. Employment of 150 additional men will be necessary, Bridgeman said.

The service plan includes three immense stations—the one already established, another in the extreme East End and the third in the West End. Five smaller stations financed by the company but handled by dealers complete the Overland "mile-and-a-half" geographical plan.

In addition a new building four or five stories high, of steel and cement, 100 x 300 ft., will be erected on the property back of the present main service station and fronting on Carnegie Avenue. Tentative plans for the building have been drawn by the architect. The building will cost about $200,000. The Euclid Avenue service station will be converted into a salesroom, where "ready-to-roll" cars will be kept.

Nebraska News Items—The Standard Motor Car Co., Omaha, has taken the distributing agency for the Peoria in Nebraska, western Iowa and South Dakota.

Card, Adams & Brown of Lincoln, Neb., have taken the agency for the Chandler and will establish a local dealer in Omaha.

R. E. Davis has been appointed manager of the Murphy-O'Brien Co., Omaha. Douglas Bowie will be retail sales manager for the Paige and Dodge cars handled by this company.

The Hupmobile Co. of Nebraska has appointed G. H. Houliston, formerly with the Lininger Implement Co., to be manager of the Hupp branch house recently opened in Omaha.

Minneapolis News—The Northwestern Automobile Co. will open a new building May 1 at 1500 Harmon Place for the sale of Saxon and Chandler cars. It will be three stories and basement, giving 25,000 sq. ft. floor space and to cost $30,000. The show room is to be 50 by 90 ft.

The Fawkes Auto Co. will complete in two months a $75,000 building, three stories and basement, of steel concrete and terra cotta, to be occupied by the Brice Auto Co., Grant cars; Northwest Hupmobile Co., Hupmobiles; John E. Fawkes, Oldsmobile.

New quarters for the Goodyear Tire & Rubber Co. will be erected at Harmon Place and Thirteenth Street, 66 by 150 ft., three stories and basement. This will give the northwestern branch double its present capacity.

St. Paul News—The Detroit Electric Car. Co. has moved to Grand Avenue and Victoria Streets to get larger quarters. E. P. Wright has resigned a railroad position to become Twin City representative of the Gary Motor Truck Co., with offices at 1032 Merchants Bank Bldg. and show rooms at 352 Market Street.

E. R. Boutell, Inc., is a new automobile sales company, headed by E. R. Boutell, J. M. Boutell and M. B. Mitchell. Capital is $50,000 and liability limit $100,000.

An independent oil company has been capitalized at $50,000 by Harry Loomis, Ross Larson, H. P. Keller and H. L. Dunn. It is called the Nonpareil Oil Co., and plans to build.

The White Auto Supply Co., St. Paul, has been formed, and J. T. White has resigned from the Bartles Oil Co. to become its active head. Salesroom is in the Bartles Building, occupying a block front. The company is local agent for Federal tires and will handle accessories.

The Duesenberg Motor Co., St. Paul, is making aeroplane engines in addition to the manufacture of Duesenberg cars. The Gallaudet Aeroplane Co., of Norwich, Conn., has ordered the motors, which are 130 hp. and four cylinders. The company is making also a 12-cylinder motor for Canada.

Ohio Items—R. E. Sewell, direct from the factory at Akron, Ohio, has been placed in charge of the service department of the Columbus branch of the Firestone Tire & Rubber Co.

The Lima-Overland Co., of Lima, has closed a deal whereby a new garage will be built at 322 West Market Street, which will be occupied as a garage and sales agency.

Wisconsin Items—The Fisk Rubber Co., Chicopee Falls, Mass., is about to establish a general Northwestern distributing branch at La Crosse, and has engaged architects to plan a branch house building, two stories high, located at Sixth and State Streets.

W. H. Krueger, formerly of the Boulevard Garage Co., Milwaukee, has taken charge of the Cole Motor Co. of Chicago's business in Milwaukee and surrounding territory. An efficient service department for Cole owners has been established at 485 Jefferson Street, Milwaukee. F. E. Tabbert is associated with Mr. Krueger as manager of the retail sales department.

The Pioneer Mfg. Co. of West Allis, Milwaukee County, has been organized by H. E. Wellbourne and established a machine shop, factory and garage at 6703 Greenfield Avenue. A specialty will be made of self-starting mechanisms for motor cars and cycles. O. E. Birkekab, L. K. Anderson and D. L. Christiansen are associated with Mr. Wellbourne in the enterprise.

A. R. Callender, for several years chief clerk of the manufacturing department of the J. I. Case T. M. Co., Racine, Wis., has purchased the Badger Foundry Co. and resigned his position with the Case company to take the general management of the business.

L. K. Cooper has severed his connection with the Maxwell Motor Co. to assume the management of the Cleveland Maxwell agency at 1924 Euclid Avenue, Cleveland.

The Forest City Garage Co., distributor of the Interstate car, Cleveland, has leased a salesroom at 2052 Euclid Avenue, and will move from 10,926 Superior Avenue within a short time.

The Packard-Cleveland Motor Co., Cleveland, has exercised the option in its lease and purchased the 20-year lease on its new building at 5206 Prospect Avenue, and in addition has leased another parcel of land with a frontage of 70 ft. on Prospect Avenue. The building into which the company recently moved will be almost duplicated. The new portion will be used for the truck sales department, while the present building will be devoted entirely to pleasure cars.

The branch of the Goodyear Tire & Rubber Co., Cleveland, has moved to its new quarters on East Nineteenth Street, just off Euclid Avenue.

Southwest News Items—The Pioneer Motor Co., El Paso, Tex., is now agent there for the Scripps-Booth and Moon. This company also handles Kissel and Denby trucks.

H. A. Deans, manager of the McArthur Bros. branch at Tucson, Ariz., has purchased the Velie garage, formerly operated by J. Wood Walker, and will conduct it as a service station for Dodge cars.

The territory of the Southwestern Carburetor Co., Michelin tire agent at Phoenix, Ariz., has been extended to cover the entire State.

Little Bros. to Enlarge.—Little Bros., Port Huron, Mich., who have a foundry here, where certain parts for the Buick cars are made, will enlarge their plant. A building, 60 by 66 ft., is in course of erection now, and another, 30 by 66, will be started. The members of the concern are A. R., E. and W. F. Little and Henry Holth.

Oregon Items—W. M. Morris, an executive official of the Weed Tire Chain Co., spent the past week in Portland, Ore., visiting the company's trade connections. Mr. Morris is one of the directors of the company and is about to go to Europe to look after the Weed interests.

W. J. La Casse, manager of the Northwest zone of the Maxwell company, reports that 100 Maxwell cars were sold in the State of Oregon during the month of February. The Salem, Ore., agency alone took twenty-two cars of this allotment.

Michigan Items.—The Detroit Engineering Products Co., Detroit, manufacturer of automobile accessories, has moved its offices to 604 Woodward Avenue.

During the first half of March $674,110.66 was paid to the employees of twenty-one Flint, Mich., local manufacturing concerns, of which fifteen make either automobiles or motor car parts and accessories. Four concerns, the Buick, Chevrolet, Weston-Mott and Mason companies paid out $40,000 more than during the second half of February.

The Ross Automobile Co., Detroit, has opened local salesrooms at 734 Woodward Avenue, Detroit, under the name of Ross Motor Sales Co.

The Central Garage, Cedar Springs, Mich., has been formed by Carl Zunwalt, Roy Peasley and George E. Waycott.

M. L. Perigo, Alma, Mich., has taken the agency for the Dort for Gratiot County and part of Isabella County.

Claus Co. Breaks Ground—The Claus Automatic Gas Cock Co., now located in leased quarters at 2601-2605 Vliet Street, Milwaukee, has broken ground for a plant of its own on Booth Street, near Keefe Avenue, Milwaukee. The main building will be 90 by 150 ft. in size, of brick and steel, and will be ready about June 15.

Stephenson in Lumber Business—G. L. Stephenson, former president of the Stephenson Motor Truck Co., Milwaukee, for seven years identified with the pleasure and commercial car business of Wisconsin, has been elected secretary and general manager of the Foster Creek

Gay Plant for Sale—Bids will be opened by the receiver of the S. G. Gay Co., Ottawa, Ill., for the plant and equipment of the concern. The Gay company is the manufacturer of the Gay truck. The property has been divided into several parcels, comprising a factory building and land, four lots 140 by 60 ft. each, and a three-story brick building, shop and office equipment, power plant, warehouses of frame construction, a lumber yard, wood and metal-working machinery and stock consisting of finished trucks and parts and a number of horse vehicles.